

METAL FINISHING

PREPARATION, ELECTROPLATING, COATING

PUBLISHED FOR THIRTY-SEVEN YEARS AS METAL INDUSTRY

LESS SLUDGE — LESS LOSS — WITH ZINC ALUMINUM ALLOY ANODES

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CONGRESS
SERIAL RECORD

MAR 24 1943

Start at the anode to conserve zinc. Extensive studies* have proved that zinc aluminum alloy anodes have six outstanding properties. Foremost of these is the non-sludging characteristic which effects a direct saving in zinc — right in line with our Government's effort to conserve the supply of this metal.

Here is how you benefit by using zinc aluminum (0.5% Al alloyed with 99.9% Zn) alloy anodes as compared with plain unalloyed zinc anodes:

- 1 **ZINC SAVINGS**—Practically no metal loss caused by sludging.
- 2 **CORROSION**—Smooth corrosion because of reduced grain size brought about by alloying zinc and aluminum.
- 3 **EFFICIENCY**—Better balanced anode and cathode efficiency thereby making solution more stable.
- 4 **POLARIZATION**—Appreciably less polarization.
- 5 **EFFECT ON DEPOSITS**—Give pure unalloyed electrolytic zinc deposits—smooth and highly protective.
- 6 **SOLUTION CONTROL**—Solution remains in good chemical balance since there is practically no chemical attack on anodes when bath stands idle.

If you are planning a zinc plating installation or find it necessary to convert from cadmium to zinc plating, consider zinc aluminum anodes. Shipments made promptly.



3621

MAR 22 1943

OVER ONE MILLION MAN HOURS OF DEBURRING SAVED DURING 1942 *By Users of Clepolon Deburring Process*



Adapted for use on
STEEL

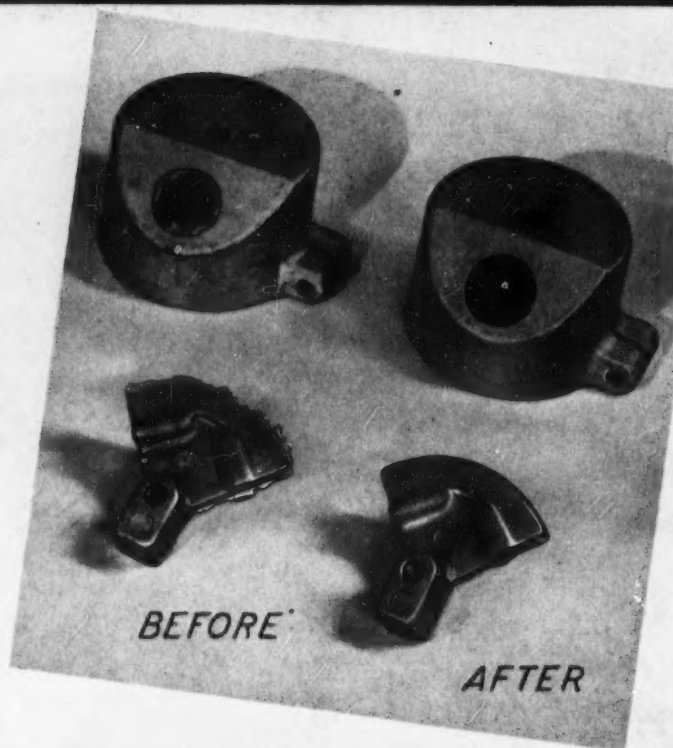
BRASS

COPPER

ZINC and

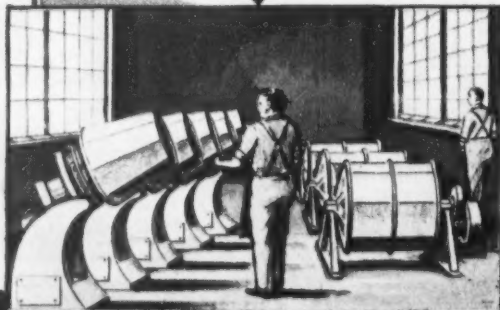
ALUMINUM

NOTE—Our Laboratories have perfected our CLEPO 19-S, a product which does not discolor or tarnish Aluminum Brass, Copper or Zinc.



Old Method

New Method



Products deburred with CLEPOLON:

1. All types of Brass Screw Machine Parts.
2. Zinc and Aluminum Aircraft Parts.
3. Steel Engine Parts (Clepolon Process also adaptable for radius work).
4. Machine Gun, Rifle, Pistol, Carbine and A. A. Gun Components.
5. Metallic belt links and Cartridge Clips.

- Contact us immediately for Demonstration -



FREDERICK GUMM CHEMICAL COMPANY, Inc.

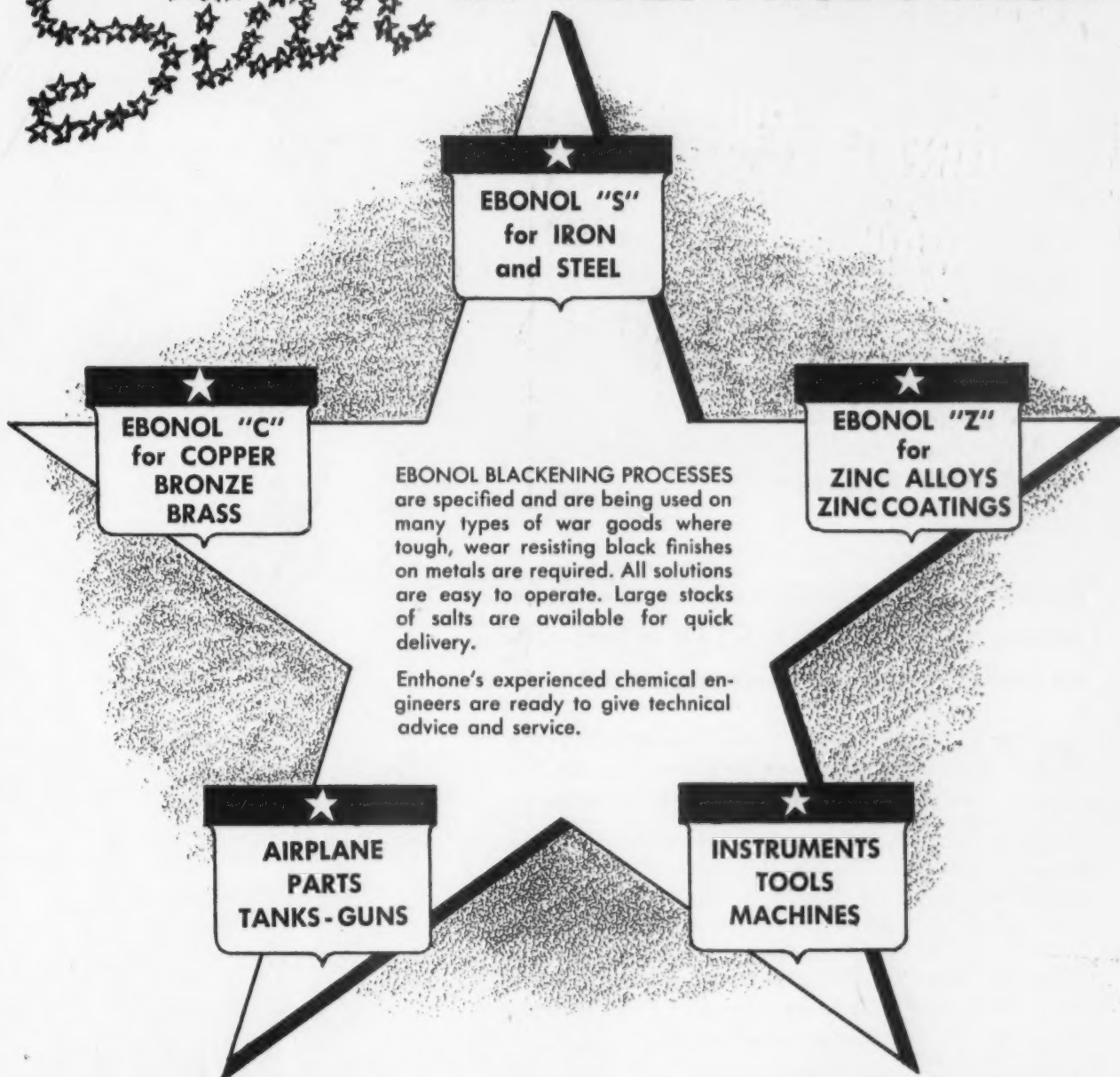
538-542 Forest St., Kearny, N. J.

EBONOL *Blackening* PROCESSES

REG. U. S. PAT. OFF.



IN WAR PRODUCTION



Chicago Representative:
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1641 Carroll Ave., Chicago

Detroit Representative:
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Larned & 3rd Sts., Detroit

Samples Processed Promptly

THE ENTHONE CO.

NEW HAVEN, CONN.

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Get this NEW, FREE booklet
on
SURFACE PREPARATION OF
your war products for
BLACK OXIDE FINISHES

Describes how **THOROUGH, FAST** Oakite degreasing provides the **CHEMICALLY CLEAN** surfaces required for finishing ferrous and non-ferrous metals!

Upon the **THOROUGHNESS** with which metal surfaces are degreased depends, to a considerable degree, the **SUCCESSFUL** application of uniform, corrosion-resistant black oxide finishes.

That is why you will find this NEW, 16-page booklet extremely helpful in expediting this important work in your plant. It describes wartime Oakite cleaning developments and techniques that remove ALL smut, oil, grease and dirt **FASTER, EASIER . . .** that safely put iron, steel, aluminum, brass, zinc and copper surfaces in the **CHEMICALLY CLEAN** condition so essential for applying satisfactory black oxide coatings . . . and that keep production moving smoothly according to schedule!

Write for your **FREE** copy of this informative booklet **TODAY!**

Manufactured only by

OAKITE PRODUCTS, INC., 18 Thames Street, NEW YORK, N. Y.

Technical Service Representatives in All Principal Cities of the United States and Canada



OAKITE

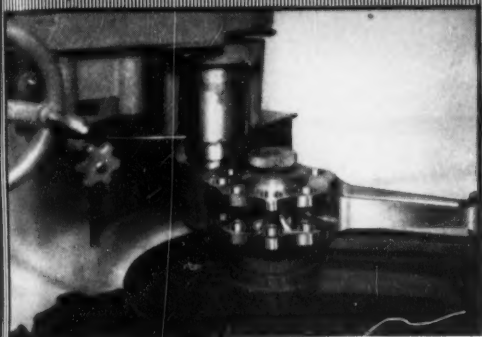
MATERIALS...METHODS...SERVICE



CLEANING

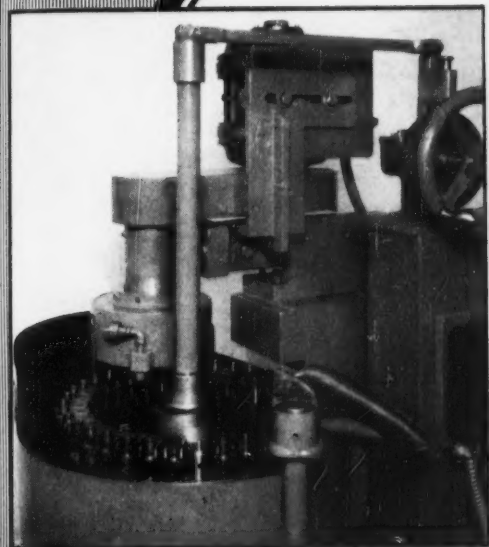
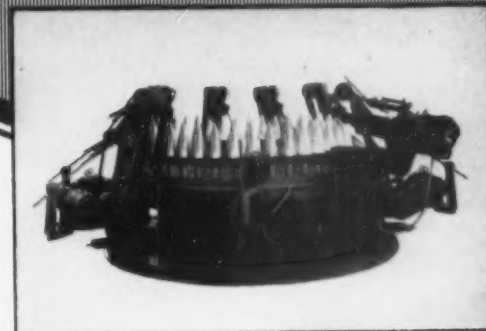
FOR EVERY CLEANING REQUIREMENT

Solving the Man-Power Shortage in **POLISHING..BUFFING..** **WIRE BRUSHING..BURRING**



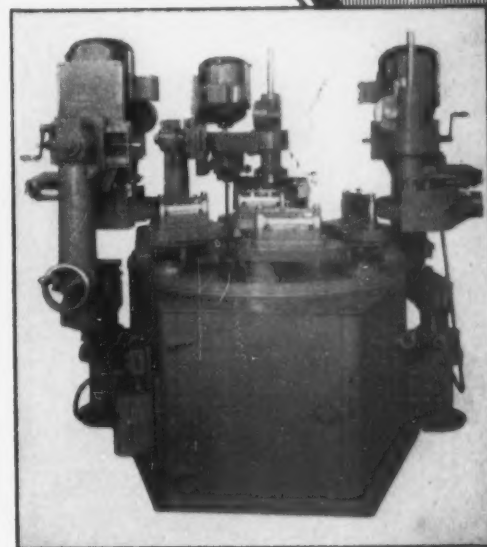
Special Acme Machine for polishing engine parts.

Special Acme Machine with 8 belt heads—for polishing tapered cylindrical parts. Multiplies daily production, with greatly reduced man-power.



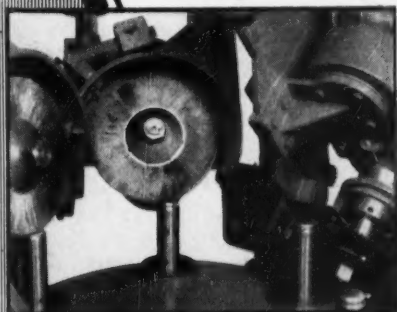
Special Acme Machine for grinding small mechanical parts—2000 per hour. Automatic wheel feed. Automatic diamond dresser. Automatic unloading.

**Keep
Production Up**
BY USING
**ACME
AUTOMATICS**
**And Spreading
Your Man-Power!**



Special Acme Machine for blending the radius in washers—1200 to 1500 operations per hour.

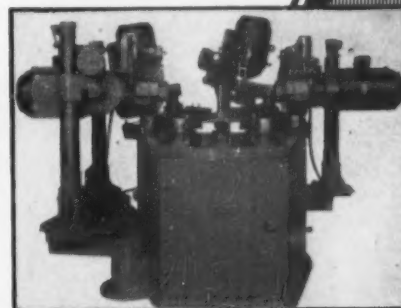
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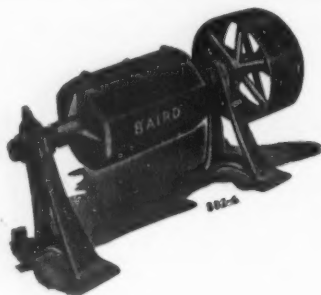
Acme Rotary Machine for polishing, buffing and wire-brushing. Big savings in man hours.



Special Acme Machine for finishing pistons. Constructed to finish valve recess and avoid sluff marks.



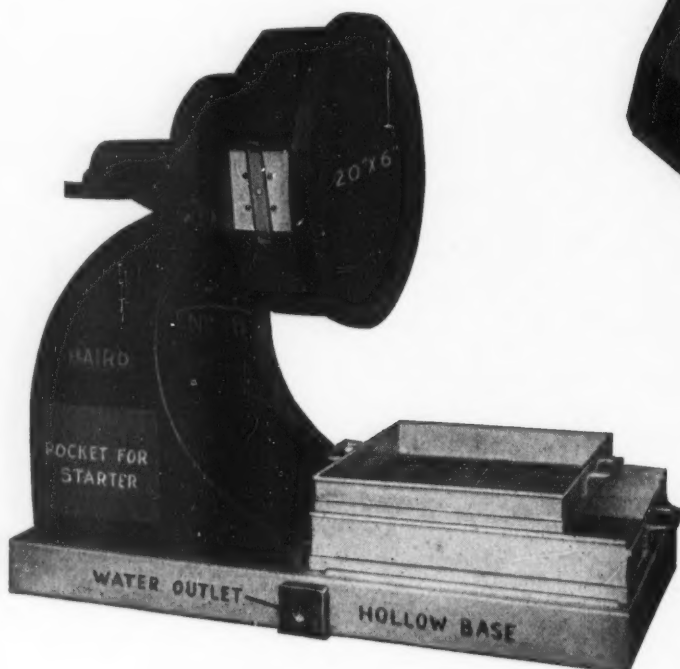
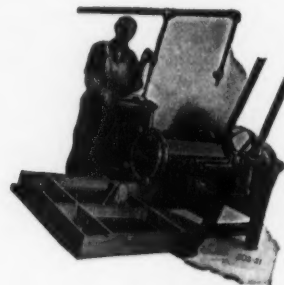
ACME Manufacturing Co.
1642 HOWARD ST. • DETROIT, MICH.
Builders OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR OVER 25 YEARS



HORIZONTAL BARRELS



TILTING BALL BURNISHING BARRELS



This shows a High and Narrow Type of Barrel mounted on "Baird" Model D. or Pedestal Type Motor driven Oblique Tilting Tumbler.

As shown the barrel was lined for use for burnishing with hardened steel balls.

These barrels may be of any suitable material depending on the job. Cast iron or fabricated steel unlined or lined with rubber etc. for rolling in abrasives.

Made in 20" dia. x 6" for No. 1 Tumbler

Made in 24" dia. x 8" for No. 2 Tumbler



This shows the side of a No. 1 BAIRD Model D. Single Oblique Tilting Tumbler with a No. 22 Sheet Steel Polygonal Barrel and with an Automatic Electrical Tilting Device.

This device AFFORDS GREATEST SAFETY—LEAST LABOR—LEAST FLOOR SPACE—LEAST AMOUNT OF DISTANCE TO MOVE WORK in USING the tumbling barrels. SAVES TIME AND FLOOR SPACE.

When tumbling questions come up "ASK BAIRD ABOUT IT"

THE BAIRD MACHINE COMPANY

BRIDGEPORT, CONNECTICUT

Since 1846 specializing in high production machinery for articles of wire and for ribbon metal. Also machines to turn, bore, etc., castings, forgings, etc., up to 10½" diameter.

PLATING & POLISHING EQUIPMENT

RELIANCE
PLATING &
POLISHING
EQUIPMENT

**BUFFS
BRUSHES
CHEMICALS**
BUFFING COMPOSITIONS
PLATING MACHINERY
Chemicals, Composites,
Plating and Burnishing
Barrels, Automatic
Rolling Machines.

Chas. F. L'Hommédieu & Sons Co.
MANUFACTURERS
Plating and Polishing Machinery
Complete Plating Plants Installed

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Branches:
Cleveland
and
Los Angeles

Yes



HANDY & HARMAN 999 "PLUS" FINE SILVER ANODES

are doing their part
in the war effort . . . —

And it's an important part. For example, these ultra-fine anodes are being used in various forms on the vital job of plating airplane bearings.

They are also serving in the making of reflectors and other war products which demand the advantages of silver coating. And they are releasing urgently needed copper, nickel, chromium and cadmium by doing plating formerly done with these metals.

Handy & Harman silver anodes get the call for a large part of this work for the same reasons that caused platers everywhere to standardize on them in peacetime use—the reasons symbolized by the 999 "PLUS" FINE mark stamped on every one of these anodes.

That mark stands for the highest fineness, the right physical properties for plating, the elimination of every trace of impurities that can cause plating troubles. It is your guarantee of uniformly excellent results and uninterrupted plating production. Specify 999 "PLUS" FINE on the next anodes you order.

Made from
virgin metal

Not a trace of
harmful impurities

Always uniform



HANDY & HARMAN · 82 Fulton St., New York

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BELKE'S

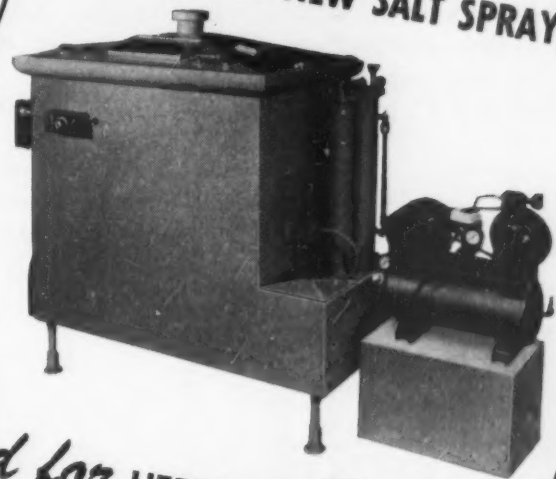
TUBE DESIGN ANODIZING RACK FOR SMALL PARTS

Increase Production

- ★ STRONGLY RECOMMENDED FOR ANODIZING SMALL AIRCRAFT PARTS
- ★ 2 LARGE CAPACITY ALUMINUM TUBES DESIGNED TO CONSERVE SPACE
- ★ SPRING TENSION
- ★ EASY TO LOAD AND EMPTY
- ★ WELL PERFORATED FOR HEAT DISPERSION
- ★ CONSTRUCTED OF 17 or 24 IN. ST. ALUMINUM THROUGHOUT

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BELKE'S NEW SALT SPRAY MACHINE



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DARCO CAPTURES "ENEMY ALIENS"..

Before They Can Damage Plating

Continuous filtration of plating solutions, with Darco S-51, removes many impurities that periodic filtration doesn't dispose of.

The only way to prevent some grease, soap, oil, decomposition products, and colloidal impurities from spreading on the plating surface . . . is to catch them on the internal network surfaces of activated carbon.

Darco S-51 is the activated carbon spe-

cially processed to adsorb impurities continuously from the solution!

Leading plants are filtering with Darco S-51 with complete success. And Darco's continuous filtration permits much smaller dosages, because impurities are not allowed to build up.

Ten cents buys enough Darco to keep 100 gallons of solution clean for a week. Be sure you specify Darco, in the trademarked package.

The article, "Physical Removal of Impurities from Plating Solutions," discusses continuous filtration in detail. Write for a copy.

DARCO—Reg. U. S. Pat. Off.



This trade-mark identifies the genuine. Accept no packages without it.

DARCO

C O R P O R A T I O N

60 East 42nd Street, New York, N. Y.

METAL FINISHING, March, 1943

HOW TO MEET TODAY'S REQUIREMENTS FOR

CYANIDE *Zinc* PLATING

CALL on du Pont for processes and materials . . . technical advice and help on any troubles you might have in installation of plating solutions and operations.

Changing from cadmium to zinc? New plating specifications? Zinc plate for specialized types of work? You can get the right answer from du Pont. Which du Pont zinc plating process to use? It depends upon what material and equipment you are working with and what type of surface you want to get.

The proper plating solution can be easily installed and used in standard plating equipment. Procedures have been simplified so that every experienced plater can easily get either dull or bright zinc plate on a wide variety of work. With the right process and the high quality of du Pont materials, every plater can get consistently good results.

A competent group of technical men with many years of experience in all types of plating will be glad to discuss your plating problems and help in the selection and application of processes and materials. Electroplating Division, E. I. du Pont de Nemours & Company (Inc.), Wilmington, Delaware.

ZINC PLATING Processes and Chemicals

"ZIN-O-LYTE"
"Zin-O-Lyte" Salts
"Zin-O-Lyte" Brightener
"Zin-O-Lyte" Addition Agent "O"
"Zin-O-Lyte" Anodes

DU PONT BRIGHT ZINC
Zinc Cyanide
"Cyanegg"—Sodium Cyanide
"RH 309"—Bright Zinc
Brightener
"Purozinc" Anodes

DUCTILE ZINC
Zinc Cyanide
"Cyanegg"—Sodium Cyanide

STRAIGHT ZINC
Zinc Cyanide
"Cyanegg"—Sodium Cyanide



ELECTROPLATING

Chemicals • Processes • Service

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

They're **FREE**



and Specially Prepared
to help you
**lick those tough
METAL FINISHING and
BURRING PROBLEMS**

Buffing and burring compounds and polishing and buffing wheels enter into some stage of virtually all precision products. We have prepared special catalog inserts — 20 pages in all — on these subjects for members of the metal finishing trade. These pages describe in detail, with illustrations, the various types of compounds and wheels for your particular work. This information will prove invaluable to you in licking those tough production problems on your war contracts. Send for them today—**THEY'RE FREE!**

FORMAX MFG. CO.

3999 18th Street • Detroit, Michigan

**ATTACH TO YOUR
LETTERHEAD AND
MAIL NOW!**

FORMAX MFG. CO.,
Detroit, Michigan

O. K.! Help me lick my production problems!

Name _____
Address _____ State _____
Attention _____



**Is Your Department a
BOTTLENECK?**

If your department is falling behind in the production schedule; if you have a problem of desoiling, degreasing, decarbonizing, surface preparation, or maintenance, there is a proven Turco Industrial Chemical Compound which will help you speed up and break that *bottleneck*. Want ideas and shortcuts? Write us for free information. Check and mail the coupon below. No obligation.

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**SPECIALIZED INDUSTRIAL
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Please send **FREE** literature on materials, methods and procedure pertaining to the operations checked below:

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Send for this 6-Page Folder

... it tells a story which no one in the metal finishing industry should fail to read!

NOW ... small parts which go into our war production require no brilliant finish—merely elimination of burrs.

AFTER THE WAR ... that's a different story! We'll go back to making automobiles and various machines for commercial and civilian use. Here, parts must have "eye-appeal"—beautiful, brilliant finishes!

Roto-Finish is the answer for that change-over, and this folder tells how YOU can capitalize on Roto-Finish Equipment.

Another Stevens Product Is "Going to Town"

Since we placed this new Buffing Compound on the market we've had many repeat orders for it. And, it's easily understood, as it was developed especially for use on Tampico Wheels and brushes. It is especially useful for de-burring and other operations where close tolerances must be maintained. It cuts fast, hangs on the wheel well and is very easy to clean.

Order 20 or 30 lbs. today! See for yourself what a beautiful job it does!



FREDERIC B. STEVENS, INC.

DETROIT, MICHIGAN

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"EVERYTHING FOR THE POLISHING AND PLATING PLANT"

How are your tanks holding up?

GLASS TANKS by "Pittsburgh" are ideal
for handling all liquids from milk to sulfuric acid

First of all, these sensational glass chemical tanks are promptly available. That's important when war restrictions have limited the supply of many materials formerly used for tanks.

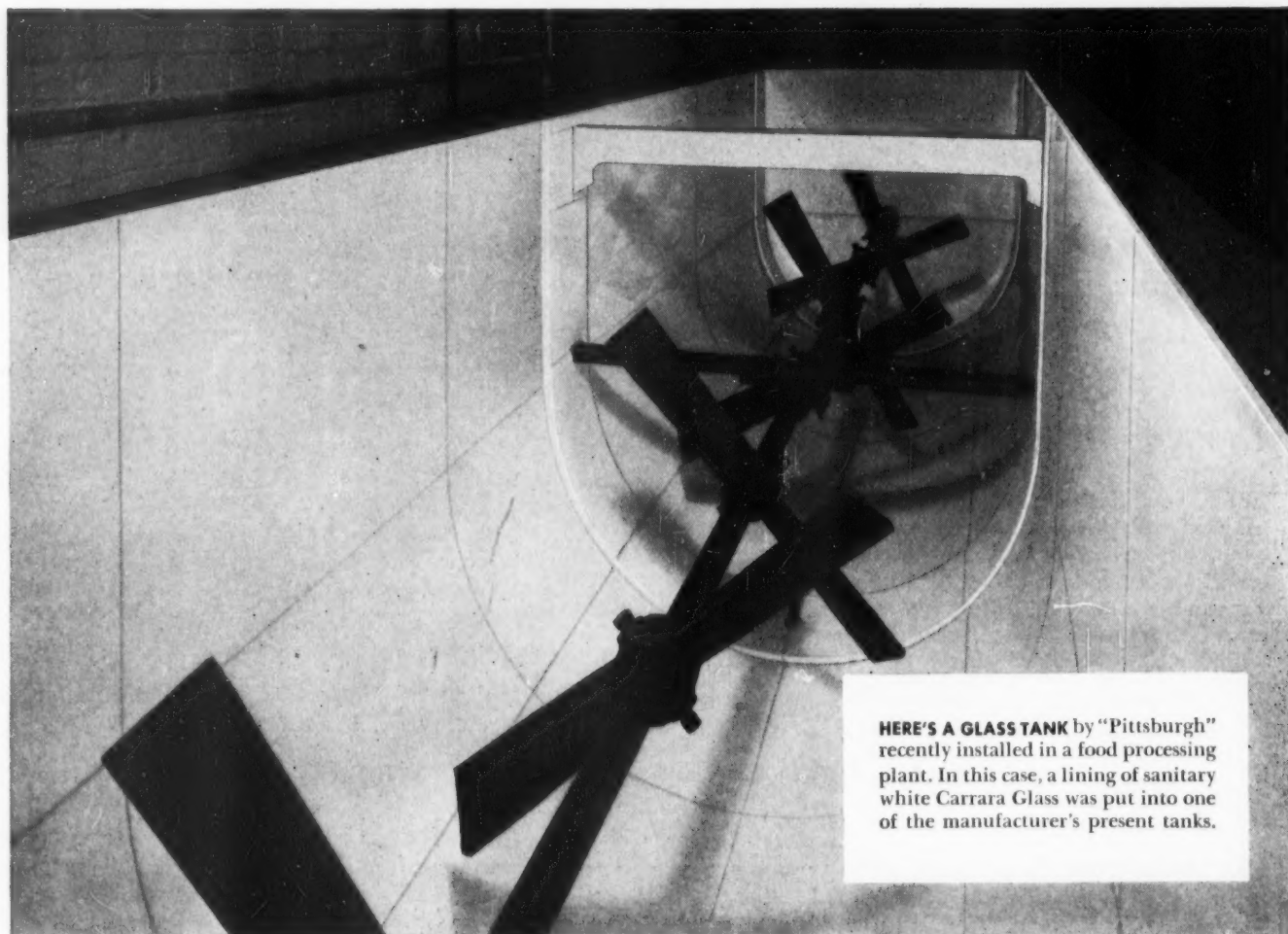
Second, glass is the ideal material for tank construction. It's impervious to acids, alkalis, chemicals, liquids of all kinds. Non-porous. Non-absorptive. Won't rot.

Won't contaminate the chemicals it holds. Smooth, flat surface. And now, since we can temper glass, it's strong enough, and resistant enough to thermal shock, to make permanent tanks!

Third, tanks of Pittsburgh Glass can be built as complete, free-standing units of opaque Carrara Structural Glass . . . or of transparent plate glass. Or we can

have our crew of workmen line your present tanks with glass, no matter what their size or capacity.

Glass tanks by "Pittsburgh" are news today! Find out about them . . . how they can help you. Write us, explaining your requirements, and let us work with you on the application of glass tanks to your needs. Pittsburgh Plate Glass Company, 2044-3 Grant Bldg., Pittsburgh, Pa.



HERE'S A GLASS TANK by "Pittsburgh" recently installed in a food processing plant. In this case, a lining of sanitary white Carrara Glass was put into one of the manufacturer's present tanks.

PITTSBURGH PLATE GLASS COMPANY

"PITTSBURGH" stands for Quality Glass and Paint

QUICK FACTS ABOUT *United Chromium* that may help you solve today's plating problems

UNITED CHROMIUM'S more than 15 years' experience in electrolytic processes has been applied to the very problems that arise in utilizing these finishes for the war effort. Every day we are assisting hundreds of important war contractors on applications that involve the use of such operations as: cleaning and preparation for plating, solution control, plating cycles, racking techniques, stopping-off, stripping and other exacting procedures. Through our engineering facilities and staff of field engineers, United Chromium makes this "know-how" readily available to platers and manufacturers who can utilize it in the production of vital war materials.

• FACILITATING CONVERSION

The advice and supervisory assistance of our field engineers has been especially valuable in assisting licensees to make the necessary changes in plating methods and procedures which new priorities or restrictions demand.

• MEETING SPECIFICATIONS

In serving hundreds of licensees, we have had wide experience in how to train platers to the

strict operating cycles and plating techniques required for work to precision standards.

• CONSERVING MATERIALS

United Chromium has developed many processes, production materials and techniques that save time and avoid waste of valuable metals and solutions.

• SUB-CONTRACTING WORK

We are prepared to recommend companies who through experience, equipment, personnel and supervisory counsel of U. C. Engineers, are ideally suited to handle your type of work.

• SOLVING TOOL SHORTAGES

The facilities of our chromium plating licensees are enlisted today in the battle against wear and corrosion—making it possible to extend the life of a wide variety of parts and tools—and to reclaim them when worn or machined off-size.

We have prepared a helpful booklet, "The Last Thousandth of an Inch", describing these applications in detail. In writing for a copy, please mention Metal Finishing.



THESE U. C. PROCESSES AND PRODUCTS ARE AT YOUR SERVICE

CHROMIUM PLATING is widely used to extend the life of equipment parts and machine tools as well as to salvage worn or rejected parts and tools.

UNICHROME* ALKALINE COPPER PLATING PROCESS makes possible ductile, fine-grained deposits which are utilized wherever they are found to be essential.

UNICHROME* ALKALINE STRIPPING BATH meets the problem of removing metals such as copper, chromium, cadmium and zinc from steel. Exceedingly fast—the bath is a mildly alkaline, non-toxic solution that does not etch the steel base metal.

UNITED CHROMIUM PROCESS FOR ANODIC TREATMENT OF ZINC PLATED STEEL and zinc based die castings, giving greatly increased corrosion resistance, is now available.



UNICHROME* "AIR-DRY" RACK COATING—A coating material for insulating plating racks used in all types of plating and anodizing solutions.

UNICHROME* "QUICK DRY" STOP-OFF LACQUER 322—An adherent, very fast drying lacquer used in cyanide copper, chromium and other plating solutions.

UNICHROME* "QUICK DRY" STOP-OFF LACQUER 323—A tough, very fast drying lacquer used in chromium and other plating solutions as well as Parkerizing solutions. Can be peeled off after it has served its purpose.

UNICHROME* RESIST LACQUER BG—A chemically resistant lacquer used principally as a stop-off in hard chromium plating and Parkerizing operations. Can be peeled off after it has served its purpose.

UCILON*—An air-drying, corrosion-resisting coating material for protecting metal, wood, concrete and other surfaces against the action of both acids and alkalies, as well as water, gasoline, oil and various corrosive chemicals.

UNICHROME* STOP-OFF COMPOUND 311—A solid, wax-like formulation which is melted and applied as a hot liquid for stop-off purposes in chromium and other plating operations.

UNICHROME* RESIST SHEET AND ROD—A solid insulating material used in constructing composite plating racks, stop-off shields, and lattices for preventing short circuits in anodizing tanks.

*Trade Mark Reg. U. S. Pat. Off.

UNITED CHROMIUM INCORPORATED

Waterbury, Conn. • 51 East 42nd St., New York, N. Y. • Detroit, Mich.

ADVANCE SAUCER WHEEL

Reaches those "Hard to Get" places



The illustration clearly shows how the underside of a bolt head or work of a similar nature can be polished so as to retain its 90 degree angle.

The side of the wheel does not touch the shank of the bolt therefore eliminating the danger of destroying or marring the thread.

The ADVANCE SAUCER WHEEL plays an important part in the production of war material and is invaluable where tolerances must be held very close.

The illustration to the left shows an ADVANCE SAUCER WHEEL 10" Dia. x 1" Face, x 1 1/4" Spindle hole with a draw 1/2" deep . . . Wheel is flat on both sides around the hole to permit the flanges and nut to hold the wheel securely on Polishing spindle.

Made in even sizes from 8" Dia. to 16" Dia. with the draw in proportion to the Diameter.

"Tailor Made" to fit your requirements.

ADVANCE POLISHING WHEELS, INC.
844 WEST 49th PLACE CHICAGO, ILLINOIS

A PUMICE
TO MEET EVERY NEED



Not until Valencia — the standard of American Pumice— was discovered at Grants, New Mexico, was it thought that a domestic pumice could match the quality of imported Italian Pumice. This inexhaustible deposit at Grants is true pumice stone and not a volcanic ash. It is physically and chemically equal in every respect to the now unobtainable Italian Pumice. • The Valencia plant's output of grades for every need is rigidly under control for particle size, purity, weight and color.

Check this table comparing Valencia with the highest grade of imported Italian Pumice. See for yourself that Valencia is truly the standard of American Pumice.

	American Pulverized Per Cent	Italian Select Per Cent
Silica	72.90	73.24
Alumina	11.28	10.61
Iron Oxide	.86	1.57
Titanium Oxide	.06	.10
Calcium Oxide	.80	1.10
Magnesium Oxide	.36	.40
Soda	3.64	3.03
Potash	4.38	5.58
Sulphuric Anhydride	.03	.05
Loss on ignition	5.20	4.04

Distributors of
THE PUMICE CORPORATION
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Warehouses: Detroit, Michigan and South Kearny, N. J.

ENGINEERED *to the requirements of*
MODERN PRODUCTION

KIRK & BLUM

DUST CONTROL SYSTEMS

are doing two good jobs for a leading
lathe manufacturer

Our assignment for the R. K. Le Blond Machine Tool Co. plant was to eliminate the saw-dust and wood-shavings in the pattern shop, also the fine metal-dust in the castings grinding department. This called for the installation of two separate systems.

A Down-Draft System using Roto-Clones with specially designed "After Cleaners" made by American Air Filter Co. Inc., was installed in the castings grinding department. Metal-dust from grinders is exhausted through floor and bench gratings into under-the-floor ducts, saving much needed space.

THE KIRK & BLUM MANUFACTURING CO.
AN ORGANIZATION OF ENGINEERS AND MECHANICS
2859 SPRING GROVE AVE. CINCINNATI, OHIO



In the pattern shop, a flat screen-type cloth filter with cyclone pre-cleaner is used as the dust collecting medium. Not only are the wood-shavings and saw-dust collected, but the air is returned to the building without heat loss and dispersal of dust on adjoining property is avoided.

In selecting different dust collecting media, we adhered firmly to the Kirk & Blum policy of making unbiased recommendations as to the best type for the individual job.

For efficiency and dependability in dust control—Consult KIRK & BLUM

SEND FOR ANY OF
THE FOLLOWING
BOOKLETS:—

"Dust Collecting Systems in Metal Industries."
"Fan Systems for Various Industries."
"Blower Systems for Wood-working Plants."
"Industrial Ovens."
"Cooling Systems for the Glass Industry."
"Data on Kirk & Blum Production Facilities."



NATIONAL DEFENSE.

IF YOU

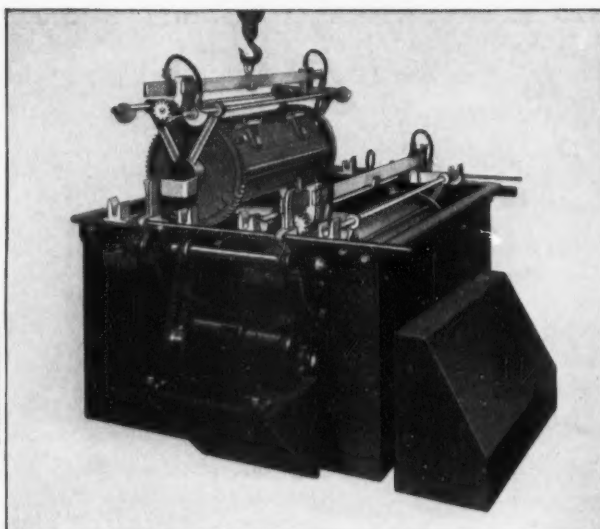
are engaged in producing for National Defense, we are prepared to help you in many ways to **SPEED UP PRODUCTION.** Our field engineers are at your service without obligation to you.

There is no substitute for "MATCHLESS"

THE MATCHLESS METAL POLISH CO.

840 W. 49th Pl., Chicago, Ill.

726 Bloomfield Ave., Glen Ridge, N. J.



Twin Unit
Barrel Plater

**For Faster,
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Lower Maintenance Costs—
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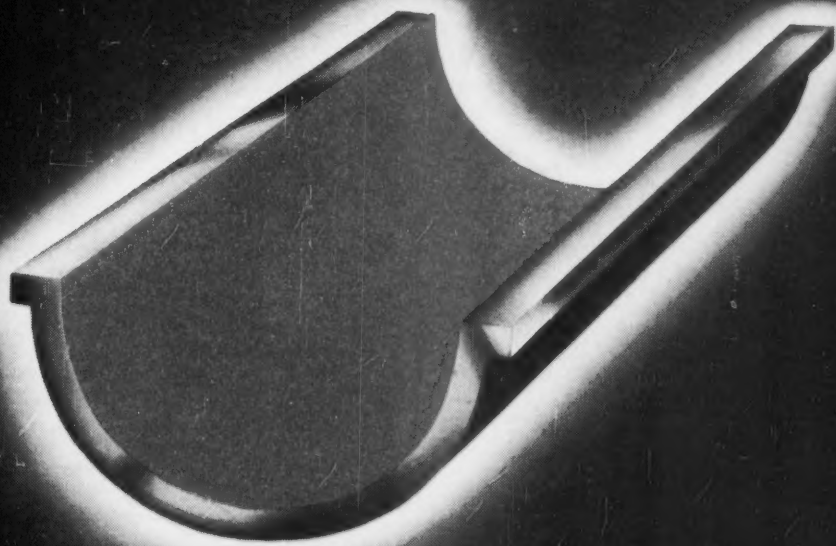
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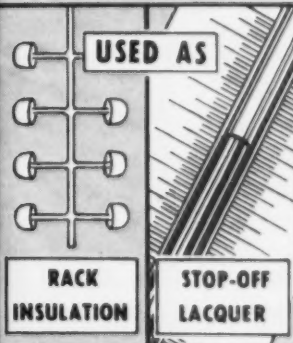
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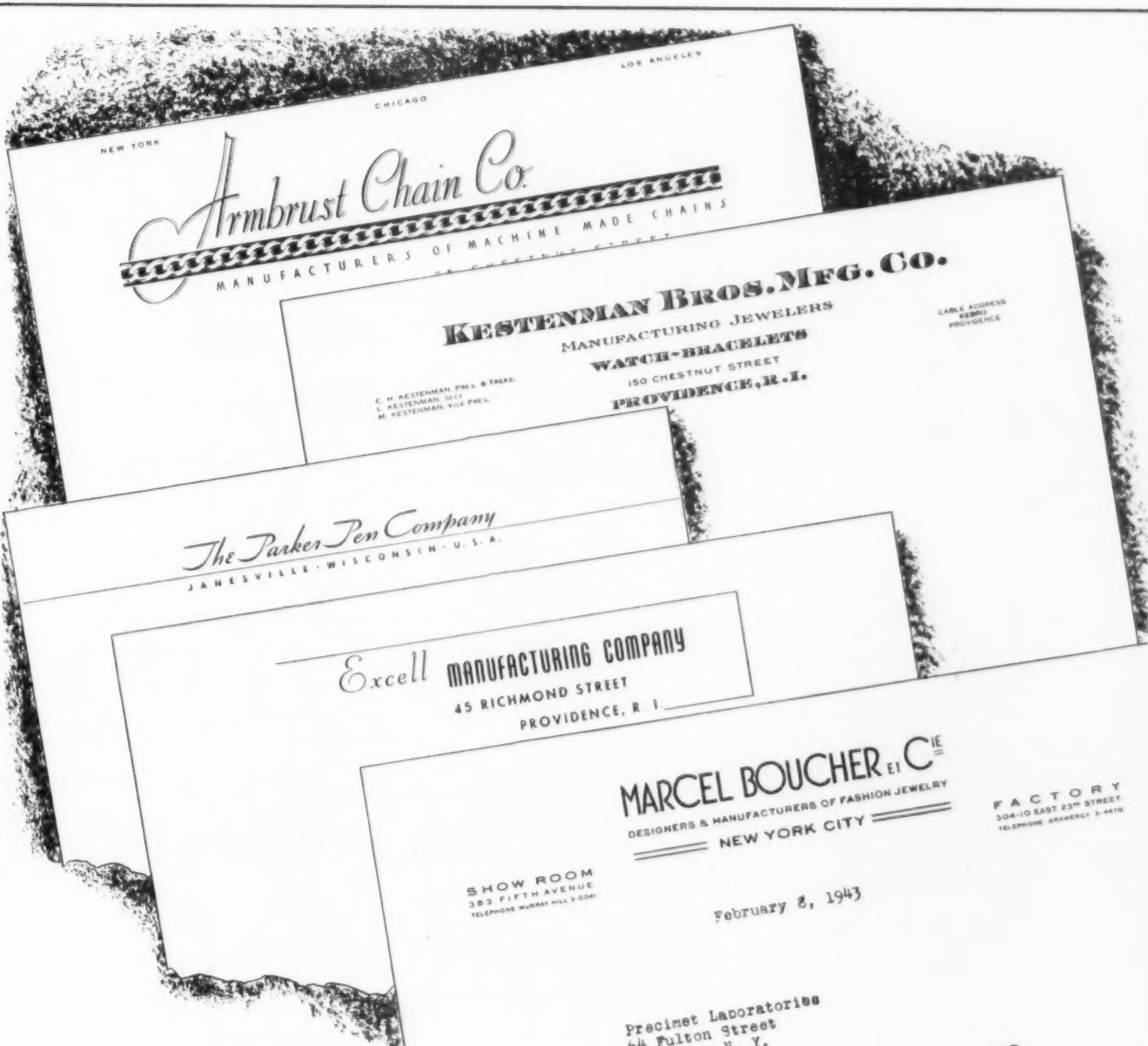
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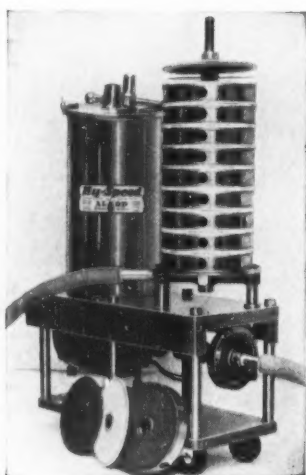
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Plating solutions that are kept completely clean of all trouble making dirt, dust, sludge, sediments and impurities, will produce finer plated surfaces, less rejects, increase your production and save lost time in cleaning tanks.

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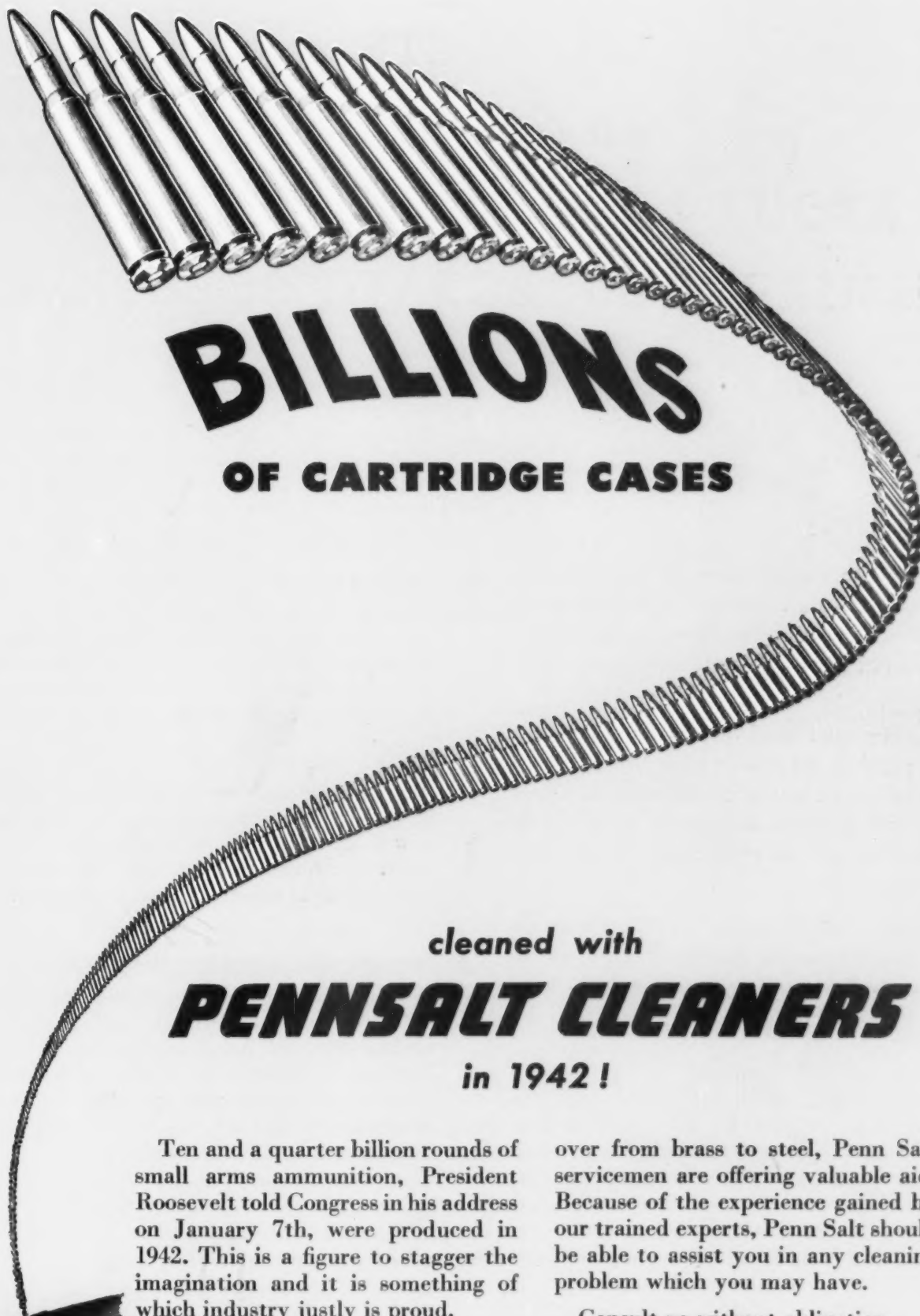
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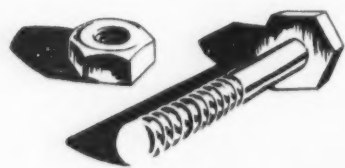
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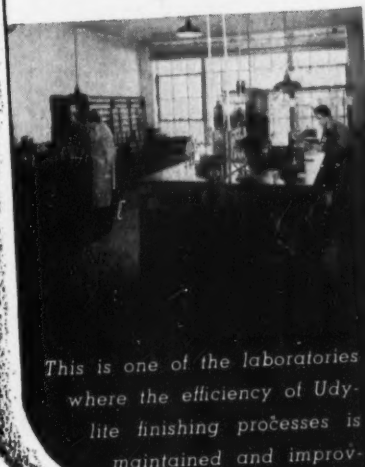
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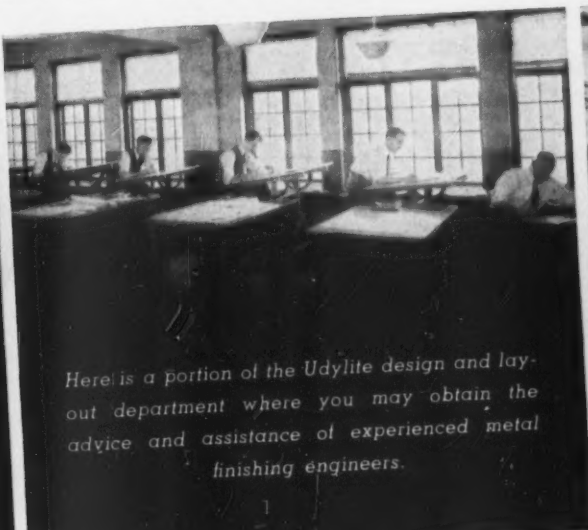
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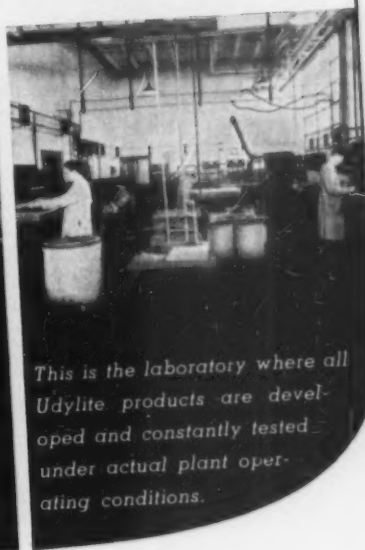
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POLISHING AND ANODIZING INFORMATION



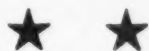
This is one of the laboratories where the efficiency of Udy-lite finishing processes is maintained and improved by expert chemists.



Here is a portion of the Udylite design and layout department where you may obtain the advice and assistance of experienced metal finishing engineers.

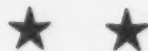


This is the laboratory where all Udylite products are developed and constantly tested under actual plant operating conditions.



For prompt, dependable metal finishing information, call on Udylite. No organization is better equipped to give you information gained from installing plating, polishing and anodizing departments in many leading manufacturing plants throughout the country. ● Trained plating engineers and electrochemists are at your service. These men know metal finishing and they can help you plan a new installation or revise your present one for greater efficiency. They know,

also, that you want information quickly. ● Udylite has a complete line of equipment . . . second to none in terms of quality and efficient performance. ● and supplies . . . for every metal finishing need. Salts, acids, anodes, buffing and polishing materials—everything required. ● Call Udylite for prompt service on your finishing requirements. You pay no more for Udylite dependability.



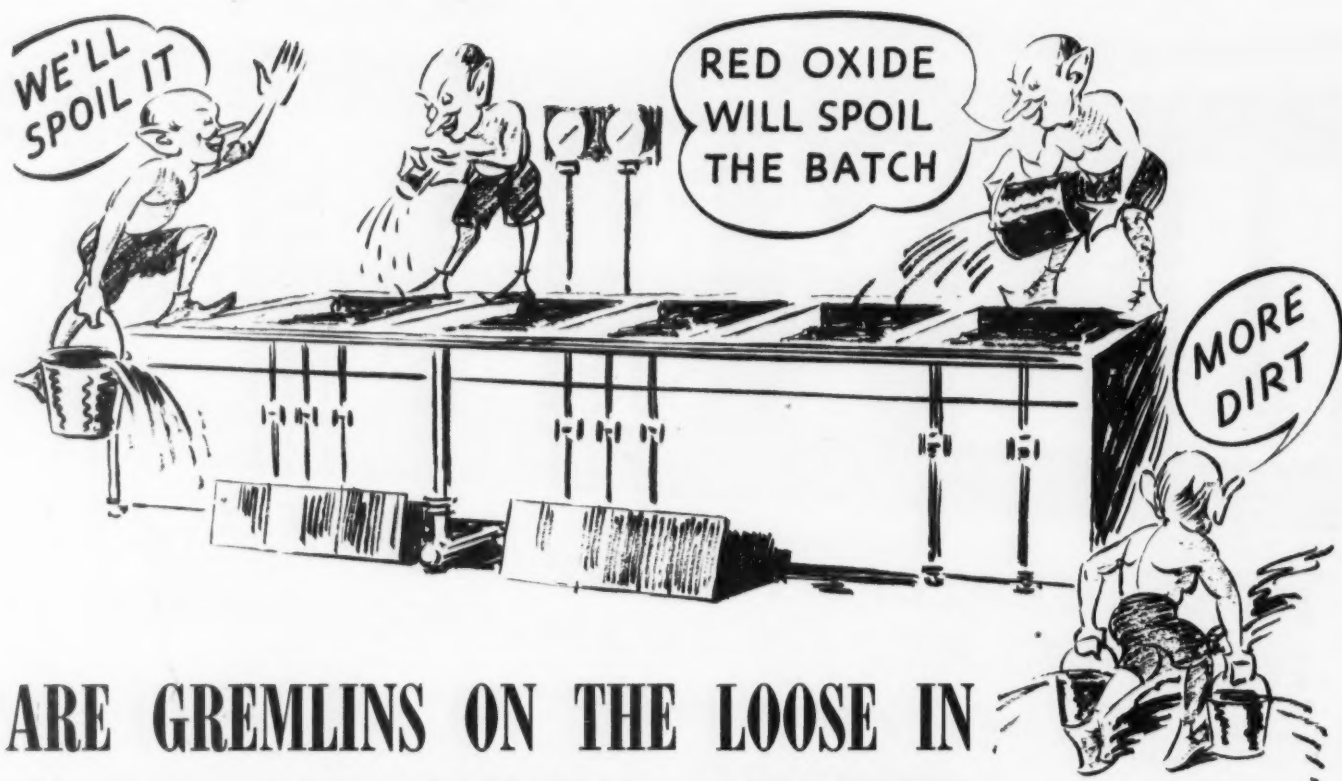
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60 E. 42nd Street

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ARE GREMLINS ON THE LOOSE IN YOUR BLACK OXIDIZING PROCESS?



Du-Lite Protects Your Black Oxide Bath!

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We guarantee to keep your processing bath clean—free of red oxide deposit or other foreign material. Will you let us help you with your oxidizing problem?

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MIDDLETOWN, CONNECTICUT

Clean, even deposit

THE REASON



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SEYMOUR

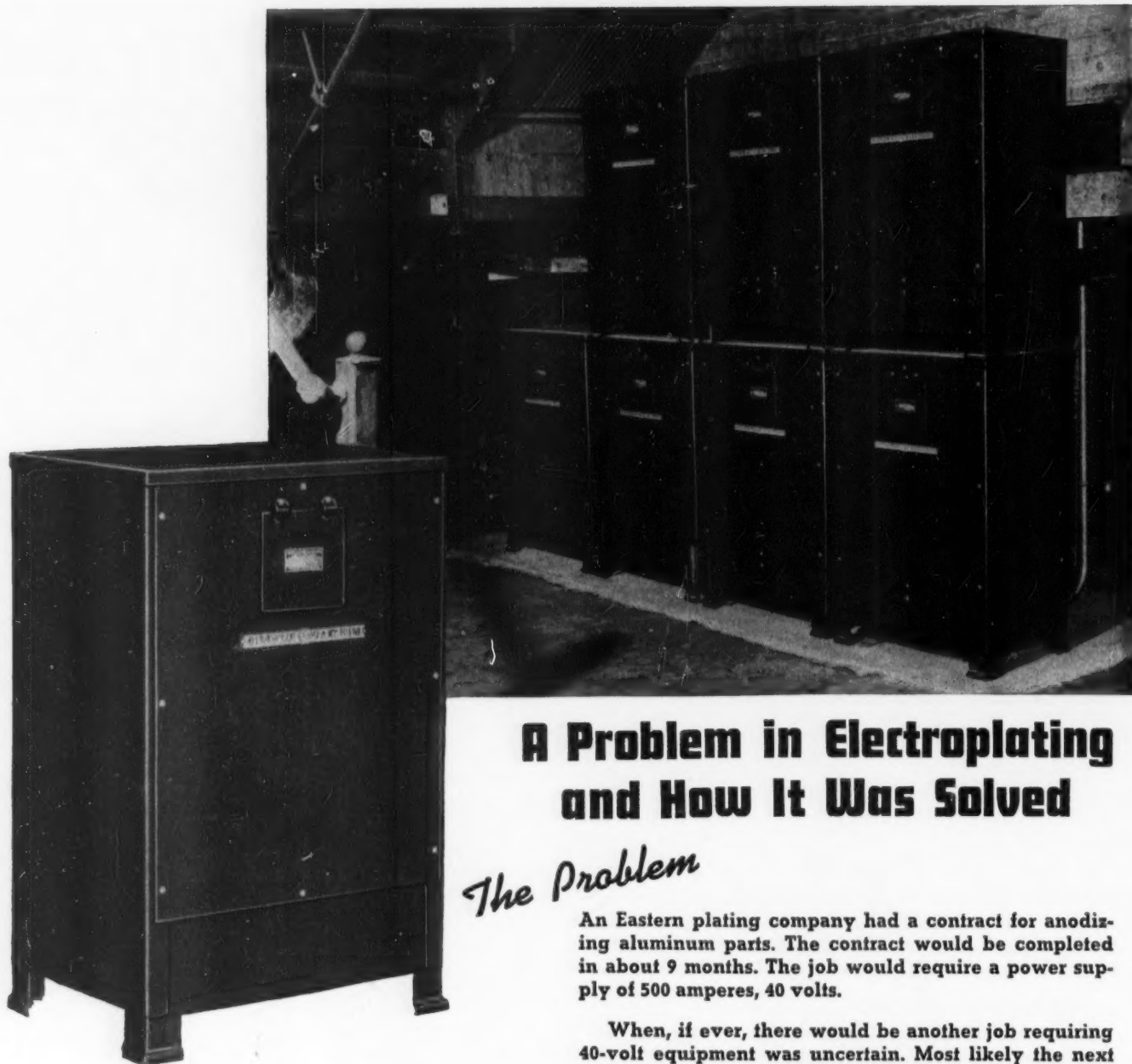
"Controlled Grain"

THE PROOF



Loose nickel in high acid or low pH baths is reduced to a minimum by using Seymour "Seycast" 99%+ Pure Cast Nickel Anodes. Note, in the above illustration, the spoke-like grains anchored to a common center. As the acid can penetrate but a slight distance between grain boundaries, these long grains tend to remain fixed throughout the entire process of corrosion.

THE SEYMOUR MFG. CO., SEYMOUR, CONN.



A Problem in Electroplating and How It Was Solved

The Problem

An Eastern plating company had a contract for anodizing aluminum parts. The contract would be completed in about 9 months. The job would require a power supply of 500 amperes, 40 volts.

When, if ever, there would be another job requiring 40-volt equipment was uncertain. Most likely the next job would be low-voltage plating requiring 6 volts. The problem was: What equipment would serve both these widely different requirements.

The Solution

Here's how the needed flexibility was obtained: Seven standard 500 ampere, 6-volt G-E Copper Oxide Rectifiers were purchased. By a series connection and regulator control, this equipment was adapted to operate over a range from 1 to 40 volts at 500 amperes. When the contract was completed, the same equipment was relocated at two different points in such a way that 4 units were used for a plating job requiring 12 volts, 1000 amperes, while the other 3 units were set up on a job requiring 6 volts, 1500 amperes.

This illustrates only one of the many electroplating power supply problems that can be solved through flexible G-E Copper Oxide Rectifiers. Whatever your problem, General Electric Metallic Rectifier Engineers will be glad to consult with you. For additional information, write to Section A333-75 Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn.

GENERAL  ELECTRIC

A reliable cleaner for war production

WYANDOTTE METAL CLEANER F. S.

- Here is a quick dissolving, long lived, heavy duty cleaner. Built to remove "smut" from steel prior to plating; for stripping Cuprodine and for cleaning small arms ammunition between draws and ahead of plate.
- Wyandotte Metal Cleaner F. S. handles many other cleaning problems. It has high conductivity and excellent rinsing properties.
- There is a Wyandotte cleaner for *every* problem—for use in *all* types of equipment. Wyandotte Field Men are available to help with any cleaning jobs.



SERVICE REPRESENTATIVES IN 88 CITIES

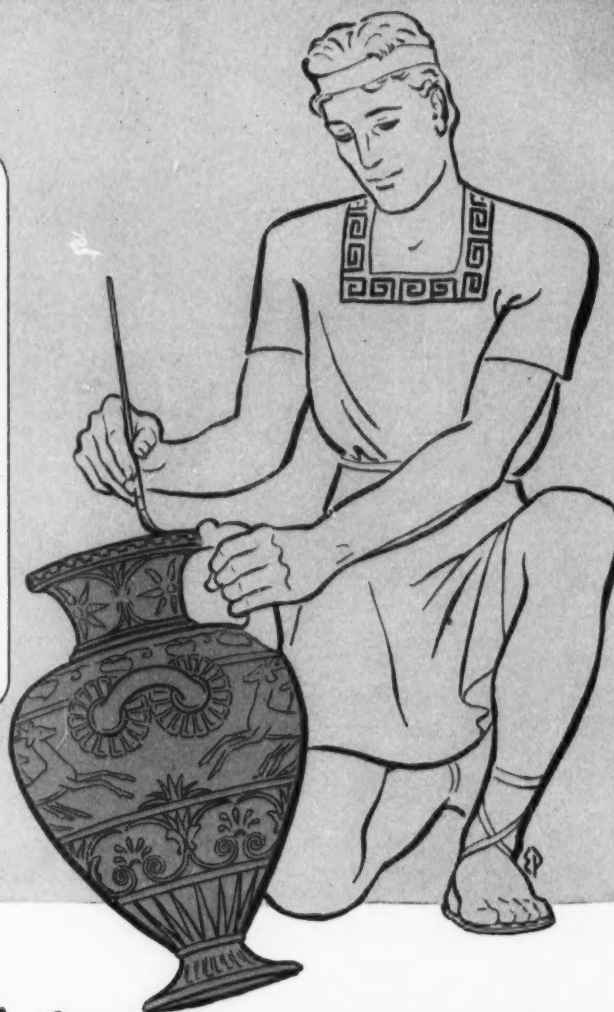
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J. B. FORD DIVISION • WYANDOTTE, MICHIGAN

Wyandotte Chemicals Corporation consolidates the resources and facilities of Michigan Alkali Company and The J. B. Ford Company to better serve the nation's war and post-war needs.

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Masterpieces OF POTTERY



Chemical Stoneware
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THE SAME PAINSTAKING selection of the finest clays, the same careful molding and baking that made Grecian pottery famous and time enduring, is being carried on today by General Ceramics. Unlike the pottery of the Greeks, however, distinction in General Ceramics Chemical Stoneware is gained not through decoration and delicacy, but through tested quality and

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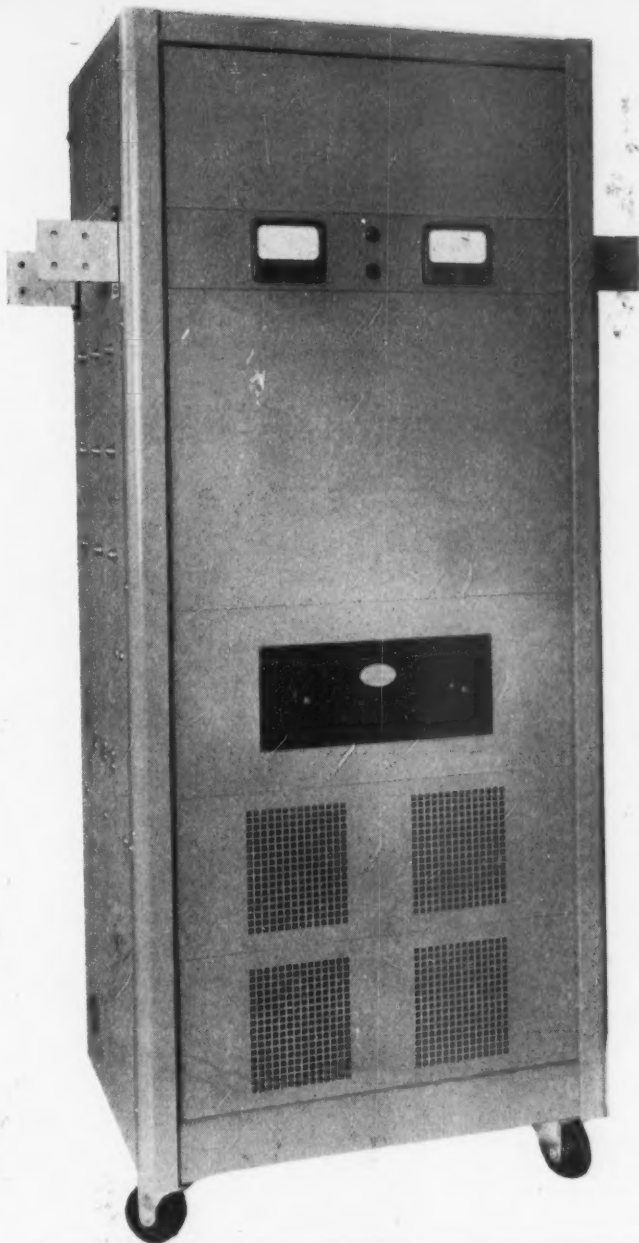
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CHEMICAL STONEWARE DIV.
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Write for illustrated booklet showing more types. Selectro-Platers are built for 6, 12, 18, 24, 36, 48 volts and higher in current ranges from 25 to 3000 amperes and higher. Units are engineered for electro-plating, electro-cleaning, electro-polishing, anodizing, etc.

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No maintenance—no moving parts—no “time out”.

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PLATING BARREL APPARATUS
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METAL FINISHING

VOLUME 41

MARCH, 1943

NUMBER 3

Publication Office:
11 West 42nd St., New York



L. H. LANGDON
Publisher

THOMAS A. TRUMBOUR
Business Manager

NATHANIEL HALL and
G. B. HOGABOOM, Jr.
Associate Editors

PALMER H. LANGDON
Assistant Editor
Corps of Engineers, U. S. Army

JOAN TRUMBOUR
Advertising Manager



PUBLISHED MONTHLY—Copyright 1943
by The Metal Industry Publishing Company,
Incorporated, 11 West 42nd St., New York,
N. Y. Entered February 25, 1903, at New
York, N. Y., as second class matter under
Act of Congress, March 3, 1879. Re-
entered as second class matter June 13,
1940, at the post office at New York,
N. Y., under the Act of March 3, 1879.

SUBSCRIPTION PRICES: United States,
\$2.00 per year; Canada, \$2.50 per year
(includes 50c exchange and tax). Foreign
\$5.00. Single copies 25c. Please remit by
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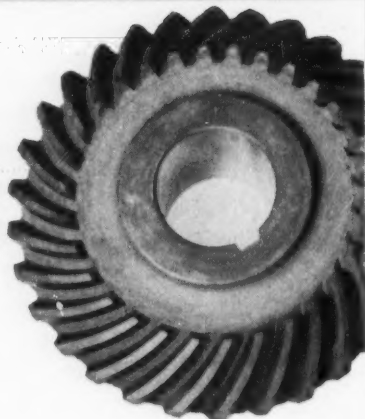
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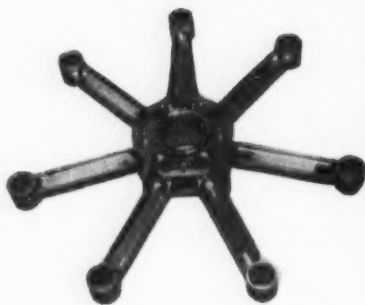
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BURRS . . . BURRS . . . BURRS

HERE are three different metal parts going into three different war implements. Except for the fact that they are made of metal there is little in common between them. Even the metal is different. Yet all had burrs which by methods formerly used were difficult and costly to remove.

But LEA Methods and LEA Materials took care of the problems nicely . . . saving on labor, meeting specifications better and reducing rejections.

Is your product similar to one of these—or is it entirely dissimilar? It makes no difference. If it involves a burring problem . . . or a polishing or buffing problem . . . write us about it in detail. Or ask to have one of our field engineers call. Perhaps we can be of help.

THE LEA MANUFACTURING CO.

WATERBURY, CONN.

Burring, Buffing and Polishing . . . Specialists in the Development of Production Methods and Compositions

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**Effectively and
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by
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and
LEA
MATERIALS**



ANODES MUST BE PURE

This seems to be a good time to point out that due caution should be exercised in the purchases of anodes these days. The purchasing agent who, in times of peace and plenty, ordered his anode requirements from his regular plating supply house or an established anode manufacturer, now finds that delivery dates are not to be depended upon and under pressure from the plating department, he is sometimes forced to look for a quick source of supply, which in many cases turns out to be a foundry or a firm dealing in reclaimed metals.

Anode manufacturers, through long association with the plating industry, are fully familiar with its requirements and the purchaser is reasonably sure of receiving material which will be suitable for his purpose. Metal dealers who are unfamiliar with plating requirements cannot, however, be expected to know, for example, that in a 95 per cent nickel anode, the composition of the remaining 5 per cent is of critical importance. Thus, 5 per cent of carbon, iron and silicon would be allowable in such an anode but if the anode contained as little as 1 per cent copper it would be absolutely unsuitable for plating purposes even if the balance of the anode were all nickel.

The effect of impurities in the anode is probably of most importance today in the case of zinc plating, especially bright zinc. Contamination of such solutions with even minute quantities of such metals as copper and lead results in dark zinc deposits, the appearance of which is not improved by a subsequent bright dip; whereas appreciable percentages of metals such as calcium, magnesium and aluminum have no effect on the deposit and are even beneficial in preventing metal build-up in the solution, which often results from the high anode efficiency in zinc plating.

When it is considered that an anode cast from Prime Western zinc may contain as much as 2 per cent lead and its use in alkaline baths will have a ruinous effect, the importance of using anodes of the proper *composition* is readily understandable.

If, at times, it becomes necessary for a user to make his anode purchases from sources other than reliable supply houses or anode manufacturers because quicker delivery is required, he should request an analysis. If this is not available, at least a few anodes from the lot should be tested for a few hours in a crock or small tank filled with solution, before the anodes are placed in the production line.

This precaution will insure continuous, trouble-free operation and will forestall possible shutdown of the plating line while impurities are removed from the solution.

PLATERS ARE CLASS B PRODUCERS

To clarify some misunderstandings, the Repair and General Services Section of the WPB Service Equipment Division issued this form letter to electroplaters, galvanizers and metal coaters on February 23, 1943, informing them they are Class B producers who render services.

To: Electroplaters, Galvanizers, and other Metal Coaters:

In response to numerous inquiries, this letter is intended to clarify the status of your industry under the Controlled Materials Plan. Contrary to the general impression, you are not considered as an "A" producer since the instruction sheet accompanying Form CMP-4B specifically states that this Form is to be used by all *service shops* as well as research laboratories and repair shops. (See CMP-4B General Instruction Number 7.)

Therefore, to obtain production material in the form of controlled materials for the second quarter of 1943, you should file Form CMP-4B, if the amounts of such material are greater than can readily be obtained from warehouses as provided for in CMP Regulation 4.

For the interim period, until you receive your allotment on Form CMP-4B, you may operate in accordance with Priorities Regulations 11 and 11a during the second quarter provided you are a PRP unit. If you are not a PRP unit, you may, during the interim period, operate by extension of rating in accordance with Priorities Regulation 3, or by applying on Form PD-1A.

The means for securing maintenance, repair and operating supplies is provided for in CMP Regulation 5.

For manufacturers, operating a Plating Department within their plants and plating their own products, the plating requirements will then be handled on an "A" product basis. The small order provision of CMP Regulation 1 may be used by these manufacturers for obtaining limited requirements of controlled materials.

After June 30, 1943, it is mandatory that you secure your controlled materials under the Controlled Materials Plan. Therefore, it is recommended that you familiarize yourself with the regulations and instructions of the Controlled Materials Plan.

Very truly yours,
SERVICE EQUIPMENT DIVISION
D. M. CRIM, Chief
Repair and General Services Section
War Production Board
Washington, D. C.

Hanging And Racking Airplane Parts For Processing

By W. PAUL SYKES

Process Engineer, Lockheed Aircraft Co., Burbank, Calif.

WITH the advent of numerous small manufacturers into the aircraft field doing contract work for larger concerns, it has become increasingly important to provide them with all the information necessary to carry on with their work. Many of these concerns have had no previous experience in work related to the production of aircraft parts. They are provided with all the engineering data necessary to set up their new equipment and with basic operating instructions and then they are told to start producing on schedule. Frequently, when they get started, they find that they have not been told the whole story. They have been told nothing about the little

adjuncts that are so necessary to successful operation. This is particularly true of processing.

They are not informed of the proper method of hanging and racking parts for anodizing, nor have they been provided with sketches and instructions on how to build the hangers, springs, baskets, or buckets necessary to efficiently and safely perform the anodizing operation. Methods of racking for chromating have not been properly explained. This information is just as important for successfully meeting schedules as is the engineering information on the setting up of the equipment.

Preparation for Anodizing

In anodizing, care must be exercised in determining the best method of hanging or loading parts. When the part first appears in the anodic section, it should be studied to find out just how it can be loaded to the best advantage. It must be suspended or loaded in such a manner that hollow portions will not collect gas and fail to anodize; the reverse of this being that the part should not be loaded with the hollow side up, in order to reduce the drag-out of the solution. Care must be taken to be certain that no portion of the part touches the tank sides or bottom through openings in the lining.

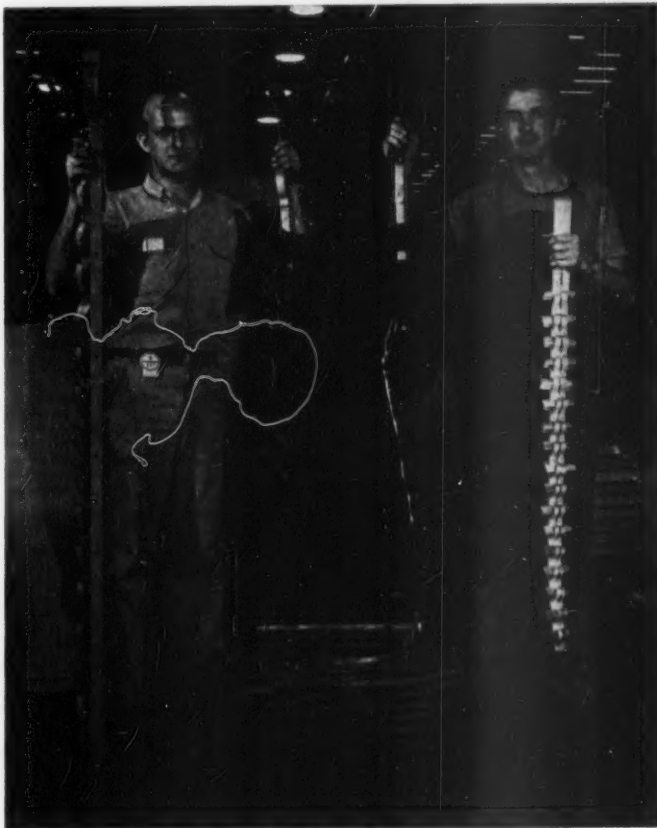


Fig. 1—This picture illustrates the clip type hangers in use. The one on the left is de-anodized by scraping the contact surface. The one on the right is dipped in caustic.

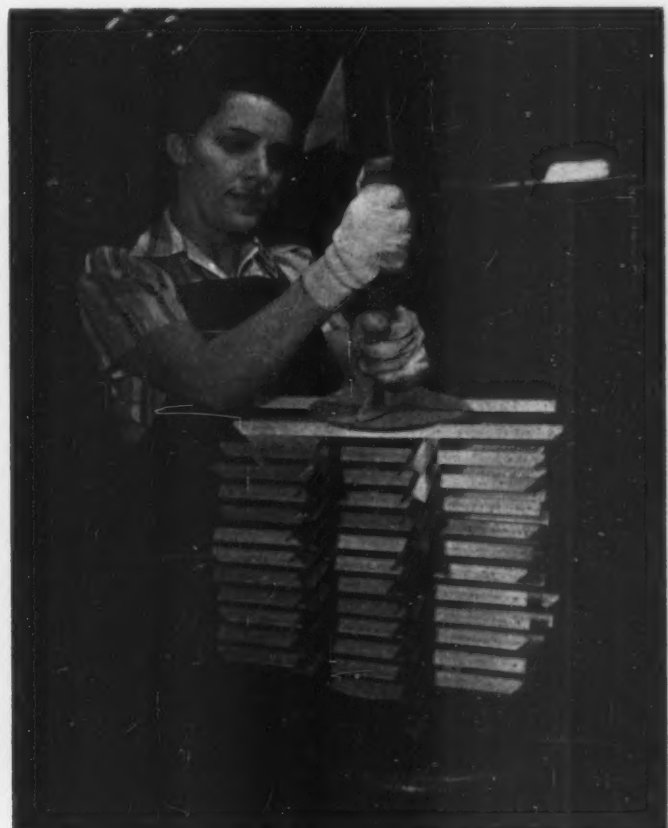


Fig. 2—This simple type of plate hanger can be used for a number of different parts.

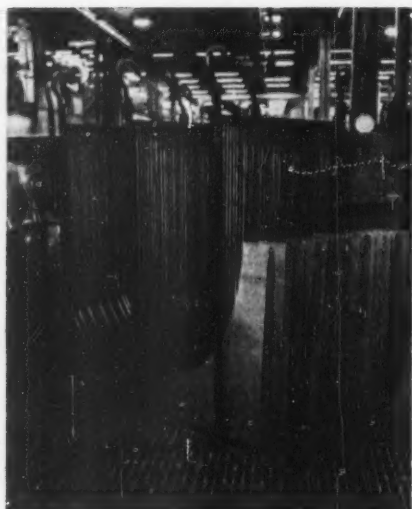


Fig. 7—Baskets and sheet racks for chromating.

When parts touch any portion of the tank, a direct short is created and arcs badly with the movement caused by the agitation. Each time an arc occurs, the part is badly burned. It must be remembered that every part in a set-up must be held firmly. Any loose part may be moved in the agitation of the solution and cause arcing when it breaks contact with adjacent parts—a condition which causes burnt spots. Firm contact is also necessary to provide a good current flow.

Bus bars must be kept polished and free of all corrosion to insure a good electrical contact and provide a free flow of the current. Along this same line, the permanent hangers must be de-anodized or scraped to remove the anodic film previously formed. This is particularly true since the anodic film is a dielectric. Some flow of current is possible without cleaning due to breaks in the anodic film caused by loading the next part, but the best practice is to remove the film before using the hanger again. De-anodizing can be accomplished by placing the hangers in a cold, caustic solution which will leave a black film which is removed by a quick dip in a 50 per cent nitric acid solution. This method is objectionable because it gradually eats away the hanger. For this reason we try to design racks that can be cleaned by scraping the contact surface. Figure 1 illustrates a special type of clip hanger that can be de-anodized along the contact edges by scraping. This hanger can be used for many differently shaped parts. This picture also shows another type of clip hanger that finds many uses in the anodic section. A great number of parts that were

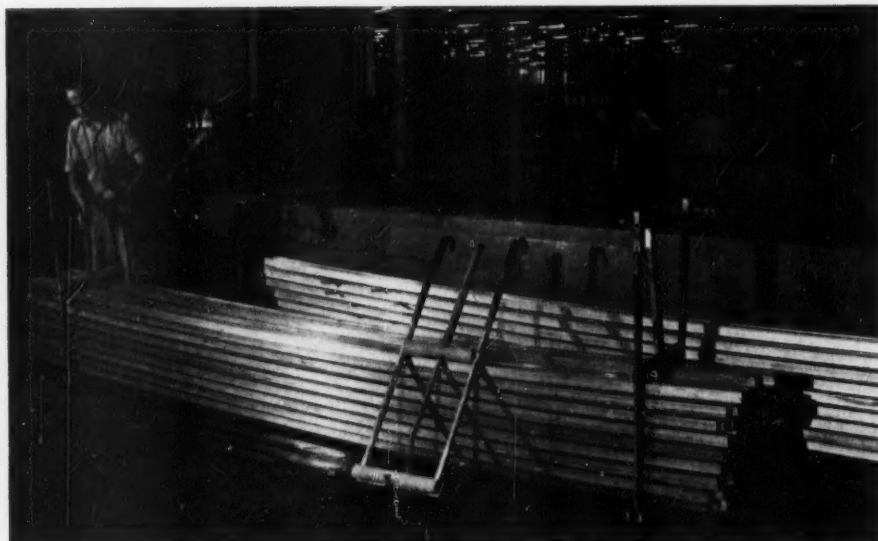


Fig. 6—This "U" type rack can be used for almost all long extrusions. Note the clamping arrangement.

formerly strung up on aluminum wire or in coiled springs are now anodized in these clips.

Unfortunately, aircraft parts vary so greatly as to size and shape that it is impossible to plan one most effective method of handling in the anodic section. Our best design under these conditions is to provide a rack or hanger that will handle as many of these parts as possible. One very important design for general utility hanging is illustrated in Figure 2. This plate hanger can be used for anodizing any type of part that can be stacked so

as not to have flat surfaces touching. The illustration shows a set-up for short lengths of stringers.

Racking or Hanging of Large Sheets

One very special problem in the anodic section is the handling of large sheets of dural. Where the volume is not too large, a hinged-rod type of hanger proves very efficient. An illustration of this type of hanger and how it is used is shown in Figure 3. One rod is bent to form the hook. It is hinged with one rivet to another



Fig. 7—Baskets and sheet racks for chromating.

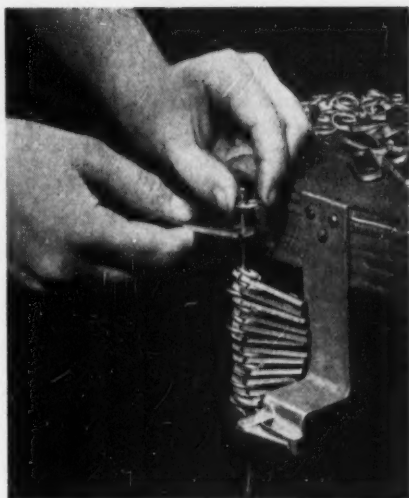


Fig. 5—Loading small parts on aluminum wire separated by wire spacers.

shorter rod on the opposite side of the sheet. Where the volume of sheets to be anodized is large, a multiple rack will anodize more efficiently than the hinged-rod type. A rack of this type is illustrated in the sketch under Figure 4. In this case the sheets are slipped between the spacers. When two or three racks are used at one time this is necessary in order to prevent the sheets from touching in the center. Contact is obtained through the notched aluminum bottom plate which is directed up the sides to the hooks. The separators and the crossed members at the top are made of wood or some other non-conducting material. Steel, or any metal other than aluminum, should not be used on any portion of the rack that goes below the surface of the solution. The weight of the sheet in the notches on the bottom member provides the necessary electrical contact for anodizing.

Loading Aluminum Alloy Castings

The anodizing of aluminum alloy castings in large quantities presents another type of problem. In this case it is necessary to provide some practical means of loading in order to avoid handling each part. If the shape of the parts is such that they have no pockets, it is entirely possible to dump them into a bucket-shaped container which has a plate that can be clamped down from the top in order to provide contact between the parts. This container must be constructed of copper-free aluminum alloy and should be riveted in preference to welding. Aluminum welds on any anodizing hanger tend to eat out rapidly during

the operation. If the body of the container is rolled from aluminum sheet, it will be necessary to punch or perforate holes in the sides to allow for circulation of the solution and escape of the gas incidental to the anodizing operation.

Spacer String Set-up for Small Parts

One of the extremely difficult problems that causes trouble in the anodic section is the anodizing of washers, small spacers and shims. In this case, due to their flat shape, it is not feasible to load them into a bucket for anodizing. The next best method is to string these parts on aluminum wire separated by spacers. These spacers are usually made by a short loop of small aluminum wire which tends to hold the pieces apart and allows them to be anodized all over. It is sometimes possible to substitute small, odd shaped

parts for spacers. Figure 5 shows a method of holding the wire while loading, which allows the operator to use both hands simultaneously. With one hand she picks up a spacer and with the other a part and places them on the wire together. When six or eight inches have been built up in this manner, the wire is removed from the clip and the parts fall down to the bottom. In a very short time the wire has been filled with parts. A loosely coiled compression spring made of heat-treated aluminum wire is put on the top and placed under compression to provide tight contact between the spacers and the parts.

Rack for Long Extrusions

Long extrusions having various cross-section shapes are usually anodized in a "U" shaped rack as indicated in Figure 6. Due to the weight
(Concluded on page 146)



Fig. 3—Above is illustrated the hinged-rod type of hanger for anodizing sheet stock. It is riveted loosely with one large rivet at the bottom.

Fig. 4—At right is shown a multiple sheet anodizing rack. Separators and cross members are made of wood or other non-conducting material.

AN INTERPRETATION OF THE MECHANISM OF BRIGHT ELECTROPLATING*

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THE deposition of two or more metals to obtain an alloy deposit having a finer grain size than either metal deposited singly under identical conditions in the same electrolyte is familiar to all electroplaters, and has been recently thoroughly reviewed by C. L. Faust.^{1, 2} However, the remarkable effect of the addition of certain organic compounds to electroplating baths to produce lustrous deposits has long been an unexplained phenomenon. The effect of purely crystalloid addition agents of unrelated chemical composition such as furfural³ used in cadmium cyanide baths; sulfonic acids,⁴ sulfonamides,⁵ and aldehydes⁶ used in bright nickel baths; carbon disulfide⁷ used in silver cyanide baths, or the sugars⁸ used in acid zinc and copper solutions, has led to a clouded and vague chemical picture that has reduced research on the subject to cut-and-try experimentation.

We wish to show that bright plating in the presence of organic addition agents is brought about by a mixture of organic bases and inorganic colloids in the cathode film, that transform normal deposition to a periodic phenomenon, reduce the grain size of the depositing metal, and restrain perpendicular grain growth by their adsorption.

Before presenting this hypothesis, the previous interpretations of organic addition action will be reviewed.

These theories fall into four general groups, which will be reviewed in the order of their appearance in the literature.

1. *Adsorption Theory.* W. D. Bancroft in 1904,⁹ and more extensively in 1913,¹⁰ discussed this function of addition agents and offered as his fourth axiom: "The crystal size is de-

creased when there are present at the cathode surface substances which are adsorbed by the deposited metal." Froelich,¹¹ Taft and Messmore,¹² and Jacquet¹³ have shown this axiom to be true of gums and proteins in acid baths, and that these colloids are included in the deposit.

2. *Reducing Agent Theory.* E. F. Kern¹⁴ in 1909 stated: "The function of an addition agent in an electrolyte is to maintain a reducing menstuum around the cathode, which, in turn, causes the deposit to form denser and smoother." Kern based his observations on the fact that reducing agents, such as polyhydroxy phenols, tannins, and aromatic amines, refined the grain size of deposits, while oxidizing anions produced coarse or spongy deposits. W. Blum¹⁵ later suggested that the function of a reducing agent could be the formation of colloid metal which would reduce grain size in a manner analogous to the colloid addition agents known in the art.

We feel that this theory is not tenable, since a cathode can be considered a more powerful reducing agent than any organic compound that will depolarize it; since colloid metals normally migrate to the anode; and since fine-grained deposits can be obtained in the presence of oxidizing anions in the tin perchlorate bath,¹⁶ in the acid copper bath containing nitrates,¹⁷ and in the chromic acid chromium bath.

3. *Complex Ion Theory.* This theory was first proposed by F. C. Mathers¹⁸ in 1916, and elaborated by him¹⁹ in 1939. Fuseya^{20, 21} and his co-workers did much careful work to establish the validity of this premise, which states that effective addition agents form complex ions with the depositing metal. While it is well known that metals deposited from complex ions have a finer grain size than those

deposited from simple solutions, we believe that the deductions made from this fact are false and misleading, and that the grain refinement is caused by the precipitation of colloids in the cathode film. This conclusion will be discussed in detail at a later point.

4. *Cathode Interference Theory.* L. B. Hunt²² in 1932 contributed a valuable paper on the structure of electrodeposited metals. Hunt concluded that: "the crystalline structure of an electrodeposited metal will be governed by the relation of the metal ion concentration in the cathode film to the concentration of the other constituents of that film. If the proportion of metal ions to inert particles is comparatively high, there will be little interference with crystal growth, and coarsely crystalline deposits will result. If, however, the proportion is low, due to low degree of dissociation, complex ion formation, high hydration of the metal ions, or the presence of colloid matter that has migrated cataphoretically into the film, or has been joined therein, there will be considerable interference with crystal growth, with the consequent formation of many nuclei."

We believe that cathode interference is responsible for grain refinement in electrodeposition, and hope to show that such interference is the result of colloid formation and adsorption at the cathode film.

It seems desirable, for purposes of this discussion, to abandon the ambiguous and somewhat misleading term "addition agent" and to substitute, as do the platers, the word "brightener." A brightener can be defined as any substance which, when added to an electroplating bath, will produce an electrodeposit with a specular reflection superior to the specular reflection of the basis metal.

We shall base our conclusions upon

* Paper presented at the 82nd General Meeting of the Electrochemical Society at Detroit and reprinted herewith with the Society's permission.

bright plating baths that have proven to be capable of continuous large-scale operation with reasonable chemical control. We will therefore take our material from the three baths, namely: bright nickel, bright cadmium, and bright zinc, that utilize organic addition agents and that are capable of continuously producing commercial deposits with a luster equal to, or an improvement upon, the luster of the basis metal.

I. BRIGHT NICKEL DEPOSITION

A. Organic Brighteners

We will begin our discussion with bright nickel plating baths because of the chemically dissimilar nature of patented and commercially successful bright nickel solutions. These may be summarized in the order of their chro-

most generally accepted explanation is that of Ostwald²⁴ who thought that rhythmic banding was a result of supersaturation and delayed precipitation. Besides supersaturation and delayed precipitation, two other conditions must be fulfilled to change a normal-type chemical reaction to a periodic reaction. E. S. Hedges and J. E. Myers²⁵ stated: "In rhythmic structures, the process only becomes periodic when the product is in the state which has come to be recognized as active." While Liesegang rings have been produced by capillary adsorption, it can be said that, in general, the presence of a colloid is essential to the phenomenon. While it is obvious that the conditions of supersaturation and an active surface exist at a nickel cathode, the necessary colloid factor of bright nickel plating has heretofore

per cyanide bath containing gelatin).

Walter Meyer²³ discussed the rhythmic banding of bright nickel deposits and bright copper plated from a cyanide bath containing lead.

It is a truism in practical plating that a thin deposit will be a bright deposit, particularly upon a buffed basis metal. Meyer²³ stated: "It is common knowledge in nickel plating that thin deposits of nickel upon a buffed surface will be bright, even from a Watts type solution which ordinarily gives dull deposits. The first layers of metal even up to a hundred-thousandth of an inch in thickness take on the orientation of the basis metal."

As Blum³⁰ pointed out, and the trade for a time accepted, alternate thin layers of copper and nickel give an ultimately finer-grained copper than an equal thickness of copper alone. Herein lies the fundamental principle of all bright plating. Through the Liesegang phenomenon, a multiplicity of bands are produced with a resultant bright deposit. Meyer³¹ showed a banded copper deposit plated from a cyanide bath containing lead, a powerful brightener in such a bath. In the same manner, bright nickel from a bath using selenious acid as the brightener³² is a similar bimetallic deposit. All etched bright nickel deposits show a rhythmic banding indicative of Liesegang phenomena. This banded structure has often been noted, most recently by Meyer³³ and by Hothersall and Gardam.³⁴ We have produced bright nickel deposits from a Watts dull nickel bath by the periodic adsorption of an organic film. A clean cold rolled steel cathode was plated for 5 seconds at 40 amp./sq. ft. (4.3 amp./dm.²) in a Watts bath at 110° F. (43° C.), rinsed in cold water, then immersed 20 seconds in a 10% HCl pickle containing 1% Rodine acid inhibitor at 120° F. (50° C.), then rinsed in running hot water, and again plated for 5 seconds in the Watts bath. This cycle was repeated until approximately 0.0005 in. (13 μ) of nickel had been deposited. While the deposit was laminated and therefore unsatisfactory, it was nevertheless bright, and the experiment offers a graphic demonstration of the proposed theory. Warm muriatic acid was used to keep the nickel surface active so that the acid inhibitor, which is believed to be a substituted thiourea, would be adsorbed thereon.

Patentee	U. S. Patent	Brighteners
1. Edmund N. Todd and Willis R. King	1,352,328	Gum Tragacanth
2. G. Lutz and L. R. Westbrook	1,818,229	Alkyl aromatic sulfonates
3. Max Schlötter	1,972,693	Colloid + naphthalene trisulfonate
4. L. Weisberg and W. B. Stoddard	2,026,718	Cobalt salts + formates and formaldehyde
5. P. R. Pine	2,029,386	Sulfonated rosin oil
6. V. H. Waite	2,112,818	Zinc salts + naphthalene sulfonates
7. W. J. Harshaw	2,125,229	Selenious acid + naphthalene disulfonate
8. Henry Brown	2,191,813 (Brit. Pat. 525,847)	Zinc or aldehydes + sulfonamides
9. W. A. Harshaw, R. Lind and K. E. Long	2,198,267	Tri-arylmethane dyes + naphthalene disulfonates

nological appearance.

Very complex are the electrochemical phenomena that produce bright and ductile nickel deposits commercially. A ductile nickel deposit is one of about 0.001 in. (0.025 mm.) thickness which, when stripped from the cathode, can be folded and creased without fracture.

The dissimilar chemical nature of the numerous nickel brighteners has long obscured the physical chemistry of the phenomena. Bright nickel deposition is, we believe, a Liesegang²³ phenomenon brought about by a periodic adsorption of a colloid, or mixture of colloids, that produces a striated deposit of high reflectivity. The well-known Liesegang rings produced by a drop of silver nitrate upon a sheet of gelatin impregnated with potassium dichromate is a classic example of rhythmic banding that offers a useful means of interpreting periodicity in electroplating. The underlying nature of this phenomenon is obscure, but the

been overlooked. It will be treated in detail at a later point. It is believed that the adsorption of these colloids is the cause of periodic deposition and banded deposits.

L. B. Hunt,²⁶ in discussing periodicity in cyanide baths made the following statement: "It seems probable, therefore, that the periodicity is due to two alternating processes, first, the deposition of metal ions, leaving a cathode film depleted of these ions, followed by discharge of hydrogen ions. The upward movement of the discharged hydrogen will promote diffusion of further metal ions, and the cycle will be repeated. Periodicity is known to be favored by the presence of colloid matter, which may cause the isolation of the growing crystal from the supply of metal ions, as apparently occurred in the experiments of Grube and Reuss"²⁷ (who reported alternate layers rich in copper and rich in protein in deposits from a cop-

The literature on the reactions of crystalloid organic addition agents in plating baths is vague and confusing, and has overlooked a determining electrochemical factor. That factor is the electrochemical reduction of any unreduced organic matter in the cathode film, when metals more noble than hydrogen in the electromotive series are being electrodeposited. A nascent nickel cathode is a potent reduction medium, and the fact that nickel deposition is also taking place does not eliminate cathodic reduction. Louis Kahlenberg and H. N. Huntzicker³⁵ investigated electrolytically hydrogenated nickel cathodes and found that they could completely reduce KMnO_4 ; arsenic to arsine; precipitate a black immersion deposit of nickel from a normal nickel sulfate solution, and even yield a trace of NH_3 from gaseous nitrogen.

Numerous electroreductions are indicated in the case of nickel brighteners. Polynitro compounds, such as picric acid, can be reduced to amino phenols in a nickel plating bath, and certain compounds, such as anthraquinone sulfonic acid or quinine sulfate, can reduce the current efficiency of nickel deposition by preferential depolarization to a point where only a fraction of the Faraday equivalent of nickel is deposited.³⁶ Potent unsaturated nickel brighteners, such as furfural and cinnamaldehyde, are reported to be resinsified under cathodic reduction.³⁷

Perhaps the most important reduction in this group is that of the aromatic sulfonic acids used in many bright nickel baths. Aromatic sulfonic acids are reduced to aromatic mercaptans.^{38, 39} This reduction is of importance for two reasons: (1) aromatic mercaptans are insoluble and may exist as adsorbable colloids in the cathode film, or may precipitate insoluble nickel mercaptides therein; (2) both aryl and alkyl mercaptans are powerful acid pickling inhibitors⁴⁰ enjoying wide commercial use.

The theory of the action of acid pickling inhibitors is somewhat controversial. C. A. Mann⁴¹ and others reason that these oxygen, sulfur, nitrogen, or nitrogen and sulfur compounds form positive quaternary ions in acid solution which are adsorbed on bare cathodic areas of the local cells or

couples to prevent further attack upon the steel. Willy Machu,⁴² however, in a study of gelatin as an inhibitor, claimed that the action was entirely an adsorption phenomenon, and that quaternary ion formation was uncertain. The correctness of either theory is not important to this discussion, but the fact that all organic nickel brighteners are either acid inhibitors or compounds reducible to acid inhibitors is of importance. The ubiquitous proteins, such as gelatin and albumin,⁴³ which brighten and embrittle nickel deposits, as well as deposits from acid and cyanide zinc and cadmium baths, and from acid copper, tin and lead baths, are also efficient acid inhibitors. The following nickel brighteners are also cited in the literature as acid pickling inhibitors: sulfonated naphthalenes⁴⁴; formaldehyde⁴⁵; acetaldehyde, furfural and benzaldehyde⁴⁶; thioureas and substituted thioureas⁴⁷; tri aryl methane dyes⁴⁸; alkaloids⁴⁹; gum tragacanth and gelatine⁵⁰; selenious acid⁵¹; glucose⁵²; hexamethylenetetramine⁵³ (probably formed cathodically in Co-Ni baths containing formaldehyde and ammonia).

Of the commercially applied organic nickel brighteners, only the sulfonamides are not in themselves acid inhibitors. When added to a 10% sulfuric acid pickle at 180°F. (82°C.), however, they gradually reduce the hydrogen evolution from low carbon steel, indicating the formation of an acid inhibitor. This inhibitor is believed to be a mercaptan, since mercaptans are the reduction product of the sulfonyl chlorides,⁵⁴ and it is assumed that the sulfonylamides act similarly under cathodic reduction.

C. A. Mann,⁵⁵ W. S. Calcott and I. E. Lee,⁵⁶ and F. H. Rhodes and W. E. Kuhn⁵⁷ have correlated the structure of various inhibitors with their acid inhibiting efficiency and have shown that, in a homologous series of bases, the inhibiting efficiency increases with increased molecular weight and increased complexity of structure so that the most effective inhibitors are generally the least soluble. This solubility factor is also true of certain nickel brighteners, such as chlorinated aliphatic aldehydes or aryl sulfonic acids, where the less soluble compounds require a lesser concentra-

tion to produce a given luster.

We have found that acid pickling efficiency tests upon steel in sulfuric acid offer a valuable means of evaluating potential nickel brighteners, since the acid pickle is a reducing medium and the steel offers an active surface for adsorption. It is believed that the action of an organic nickel brightener is similar to that of an acid pickling inhibitor in that both are organic sulfur, nitrogen, or other quaternary salt-forming compounds that are adsorbed on an active metal surface to form an insulating layer. The following mechanism is assumed for the action of these compounds as nickel brighteners.

A nickel crystal at an active center attains a higher potential than surrounding crystals. This higher potential causes the electrolytic reduction of adjacent brightener to an inhibitor which is adsorbed to form an insulating layer, which temporarily halts growth. The adjacent crystals, uninhibited, continue growth until each in turn increases potential to the reduction point, and likewise becomes filmed with inhibitor. When in this manner the entire surface is filmed, the cathode reaction shifts to nickel deposition, after which the adsorption cycle is repeated.

The phenomenon of brightening by the restriction of crystal growth to a series of planes parallel to the basis metal by the adsorption of colloids at the physically, and potentially, high points can be more readily visualized by a comparison with the brightening action of electropolishing. In the electropolishing of copper,⁵⁸ nickel,⁵⁹ iron,⁶⁰ and stainless steel,⁶¹ the work is made anode at high current densities in an electrolyte of phosphoric, perchloric and acetic, sulfuric acid, or various modifications thereof. By this method plain rolled stock can be polished to a mirror finish with, of course, no alteration of grain size.

It is obvious that these views are at variance with those of Schlöter⁶² who postulates that bright deposits are due to the reduction in grain size of the deposit that is brought about by the specific anion used. It is our belief that the grain size of a deposit from a bright nickel bath is about the same as that of the thin initial layer from a dull nickel bath of identical inorganic composition and under identical

plating conditions. The high reflectivity of bright nickel is due more to the orientation of these crystals into orderly planes that are parallel to the basis metal, and which have a high luster because the growth of any individual crystal beyond that plane is prevented by adsorbed brighteners.

Pinner, Soderberg and Baker⁶³ divided nickel brighteners into two classes, the first of which included aromatic sulfonates and aromatic sulfonamides, the second class comprising the aldehydes, ketones, aromatic amine compounds and the metallic brighteners. While the inorganic brighteners will be considered separately, the same classification of the organic agents will be used in this discussion. The first, or anionic, class of brighteners is capable of reproducing the brightness of a buffed basis metal, but not a "brightness increasing with thickness of plate on an unpolished surface"⁶⁴ without the second, or cationic, class of brighteners, which may be positively charged hydroxides.

The characteristic, banded structure of a bright nickel deposit appears to be the result of the reduction cycle of the sulfonic acids, or an equivalent brightener of the first class. At the start of the cycle the sulfonic acid, for example, could be reduced to an inhibiting mercaptan at points of high current density. The polar sulfur group of these materials would then be adsorbed to form an insulating inhibitor film. If this is the reaction, the non-polar hydrocarbon "tail" would then be electrolytically reduced, and the ring destroyed, to leave only sulfur, which is present in all bright nickel deposits when sulfonates or sulfonamides are used as brighteners. This residual sulfur is probably included in the deposit as nickel sulfide. The layer containing this sulfur inclusion is chemically more reactive than the adjacent layers, and so becomes more deeply etched when treated with an etching reagent so that a banded structure is most pronounced in a photomicrograph of a bright nickel deposit. It is believed that this reduction causes supersaturation and delayed precipitation of the nickel which is then deposited as a relatively pure layer, which again initiates the reduction cycle.

This banded structure and included sulfur is characteristic of unalloyed bright nickel deposits, although a sul-

fur inclusion is not to be considered an essential requirement for a bright nickel deposit. Selenious and tellurous acids,⁶⁵ or phenyl arsonic acid,⁶⁶ will produce deposits from a Watts type bath that are both bright and sulfur-free. Although these baths are not of commercial significance, the cobalt-nickel bath containing formates and formaldehyde⁶⁷ is, and produces a sulfur-free bright striated deposit.

While aromatic polysulfonates or aromatic sulfonamides have proven the most satisfactory agents for producing a sulfur-containing bright nickel deposit, they are not the only compounds capable of such a result.

It is of at least academic interest to note that, while benzene monosulfonic acid is not a brightener, benzene sulfinic acid is, and that brightness can be produced by sulfones, such as phenyl sulfone sulfonate, or by sulfonium salts, such as phenacyl dimethyl sulfonium chloride.⁶⁸ It is also of interest to mention that bright nickel can be obtained by the addition of controlled amounts of sodium sulfide to a Watts bath, although such a bath is transient and unsatisfactory, due to H₂S evolution and nickel sulfide precipitation. An important factor in the brightening action of an anionic brightener is the relative solubility of its reduction products. For example, benzene sulfonic acid is very soluble; benzene sulfinic acid is only sparingly soluble, and phenyl mercaptan is insoluble in water, so that these reduction products may precipitate insoluble nickel salts in the cathode film.

The aryl sulfonates or sulfonamides perform another valuable function in a bright nickel plating solution. When brighteners such as zinc, cadmium, or the amino poly aryl methane dyes⁶⁹ are used singly in a nickel bath, they produce a hard brittle deposit. When, however, these brighteners are used in conjunction with an aryl sulfonic or aryl sulfonamide brightener, a bright and ductile nickel deposit is obtained.

(To be Concluded)

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66. Brown, U. S. Pat. 2,211,535, reduced to phenylarsine: Brockman, "Electro-Organic Chemistry," p. 333, John Wiley & Sons, New York (1926).
67. Weisberg, Metal Finishing **38**, 318 (1940).
68. Unpublished work by author.
69. See footnote 67.

Synthetic Plating Insulations

By JACK McGEE

Chief Chemist, Rackote Division,
Wyandotte Paint Products Co., Wyandotte, Mich.

The Properties of Synthetic Plating Insulations; Their Use by the Plater in His Own Plant, Without Previous Experience or Special Equipment; Keeping Your Plating Racks in Repair.

IT is the purpose of this article to acquaint the plating industry in general with the uses and particularly the advantages of synthetic coatings for rack insulations and their maintenance.

Since synthetic plating insulations have been successfully employed for a number of years by both job platers and the plating departments of large industries, many readers will doubtless be familiar with all or some of the information contained in this article. However, there are still many platers who are not familiar with synthetic plating insulations. That they should have some information is essential, especially in view of the War Board's ruling in Form M-15-b, which restricts the use of natural and synthetic rubber. In this article, I shall deal only with the merits of synthetic insulations and avoid any debate on: "Synthetic Insulations versus Rubber or Similar Insulation".

There are a number of excellent synthetic coatings available to the industry . . . tough, highly resistant and flexible. These insulations vary as to type of basic material from which they are compounded, i.e. vinyl chlorides; thermo-setting and thermoplastic resins; soluble polymers of

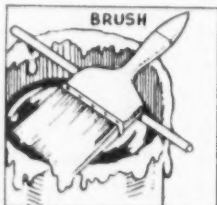
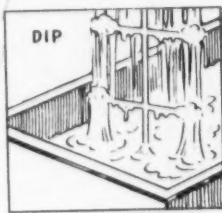
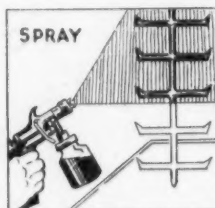
plastics; alkyd resins and plasticizers, phenol, etc. These insulations vary in physical properties, too, such as: resistance for specific solutions; color; per cent non-volatile film build per coat; drying speed; adaptability to repair and number of coats needed for efficient insulating. They all, however, are applied in a like manner—that is, by dipping, brushing or spraying, and dry similarly.

Usually an hour or two is allowed for drying between succeeding coats. Most synthetic insulation manufacturers recommend at least six or more coats for racks to insure best results. Where desired, and facilities permit, most synthetics insulations are forced-dried at moderate temperatures

—150-225° F. The baking time will vary according to each manufacturer's directions.

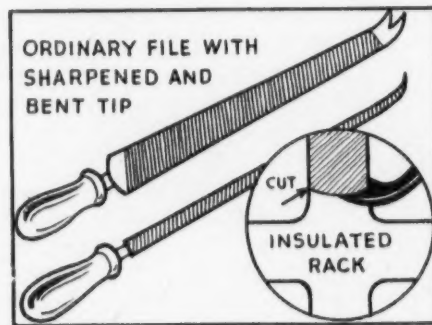
The use of synthetic plating insulations offers many factors of service, economy and convenience . . . some of which are listed here.

No special skill, experience or equipment is needed to permit the plater to do his own insulating in his own plant.

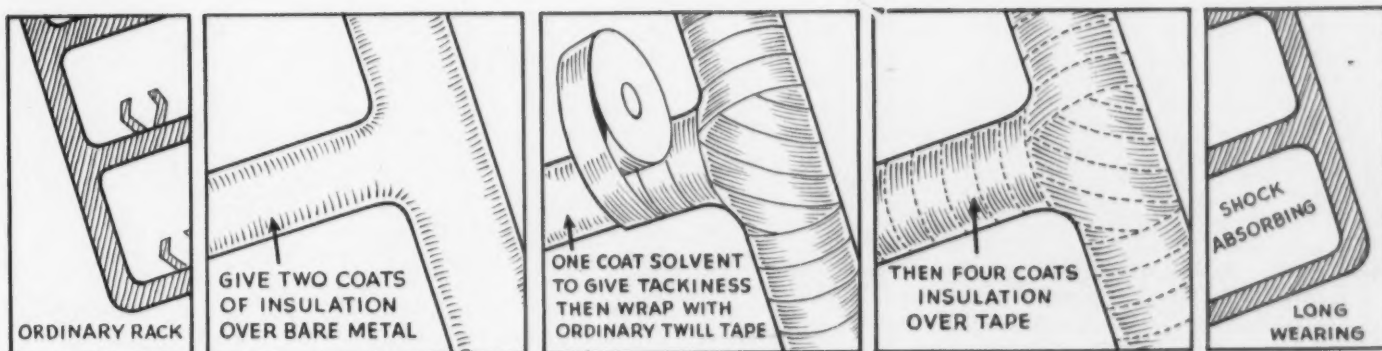


Original coating of the racks takes place in the plater's own plant. Where the purchase of the coating is less than a 55-gallon drum, the only equipment required is a dip tank to take care of the overall of the rack. If a full drum of the coating is purchased, the drum itself may be used as a dipping tank by merely removing its cover. Generally speaking, all synthetic insulations are shipped at dipping consistency and require no special handling.

Service and maintenance of the racks are easily and conveniently handled in your own plant, eliminating the necessity of shipping the racks outside the plant for repairs of insulation. Should any rack become fractured or damaged through the course of production, it is not necessary to go through the delay and expense of stripping the rack and rebuilding the insulation. Most synthetic insulations remain soluble even after continuous cycles through plating solutions and cleaners. Because of this, one prolonged dip of the rack in the synthetic solution will normally repair minor fractures or damage . . . and a complete break may be repaired quickly and easily by brushing in the



An Inexpensive Home-made Tool for Stop-off Trimming and the Cleaning of Contact Points.

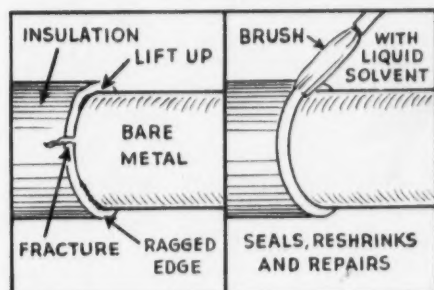


Procedure Required in Using Cotton Twill Tape to Fortify Synthetic Rack Insulation.

insulation and filling the break. After filling in a break, the rack should be given one dip coat. Patching your rack at the first indication of damage is the most economical method of operation.

The ready maintenance and repair in your own plant does away with the necessity of having more than one set of racks . . . a major economy factor.

A great aid in prolonging the life and service of synthetic insulations can be effected by the proper construction



Reducing Possibility of Seepage by Using Brush Coat of Solvent at Points Liable to Fracture, Lifting or Stretching.

and preparation of the rack itself. Let us discuss some of the important steps to take in such construction and preparation.

Rack Construction

In construction, avoid crude weld joints and extremely sharp, square joints. By avoiding these, bridging of the insulation can be almost entirely eliminated. Use rounded splines and stations. If you cannot economically or conveniently secure such metal . . . or if your present racks are not so constructed, chamfer the corners until at least the razor-sharp edges are broken down. This chamfering of the edges permits a uniform thickness of insulation on the entire rack. On a sharp-edged rack it is difficult for any insulation to build properly on the edges or build to the same uni-

form thickness of coat which will be found on the balance of the rack. Chamfering cannot be recommended too highly.

Method for Applying Synthetic Insulation

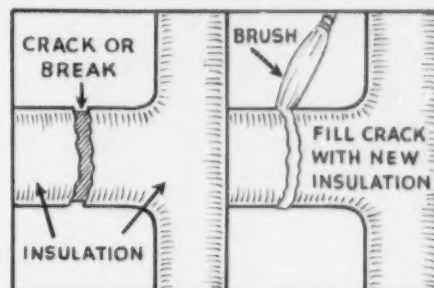
All racks or items to be coated with stop-off material should be well cleaned prior to coating. Any of the common cleaning methods will do: hot alkali followed by a hot water rinse . . . chlorinated vapor cleaner and degreaser . . . sandblasting followed by a cleaning with solvent or a solvent degreaser. Dip, brush or spray the insulation to the recommended thickness and allow each coat to dry properly before applying the succeeding coat. An interval of six to eight hours should be allowed from the time of the last coat's application, until the rack is put into service.

In cleaning or stripping, a fracture or lift is often made at the end point of the insulation, or the end is accidentally stretched. Therefore, after cleaning contact points of insulation, or after stripping for correct stop-off space, give the insulation a light brush coat of solvent at these points. This brush coat will readily repair the fracture, reseal the lift, or reshrink the end. This little step greatly reduces the possibility of seepage.

Cotton Tape Fortifies Rack Insulation

The best procedure of all for prolonging the life and service of your plating racks is through the use of tape. Use ordinary cotton twill tape, preferably 1/2-inch width. Best results are obtained by first giving the rack two dip coats of insulation. After the second coat has dried, wet the rack with solvent to give it a slight tack.

This tackiness will allow the tape to adhere and thereby give a better job. Start at the bottom of the rack and tape upward. Wind the tape as tightly as possible and then tie or tack with thread at the end. After taping, coat the rack with from four to six coats of the insulation. This method appears to be costlier and more complicated, but your efforts will be rewarded. The tape binding gives a much thicker insulating coat which increases resistance and gives a more effective plating rack. And, a shock absorbing feature is gained, not obtainable in any other procedure or type of rack. You will see the taping procedure illustrated in the figures at the top of this page.



Simple and Easy Method of Repairing Fractures or Complete Breaks in Insulation.

In concluding this article on the properties and advantages of synthetic plating insulation and the preparation of plating racks, there is one further suggestion to be made. If you are interested in a test run of one of the many synthetic insulations offered, ship a plating rack or two to the insulation manufacturer for coating, rather than write for samples. Be sure to advise the insulation manufacturer in which plating solution the rack is to be used, as some manufacturers have specific insulations for specific types of plating.

THIS IS WASHINGTON—

By George W. Grupp

METAL FINISHING's Washington Correspondent



Balanced Materials Budget

About April 1, 1943, for the first time since the beginning of the nation's war effort, the United States is expected to have a balanced budget of critical materials. Since last November, WPB officials have been urging the 14 claimant agencies to get their materials needs into the hands of the Requirements Committee under the Controlled Materials Plan.

Eleven CMP Forms

At the present time, the Controlled Materials Plan provides for the use of eleven different forms. Forms CMP-1, CMP-2, CMP-3, CMP-4A, CMP-4B, CMP-4C and CMP-7 have been issued by the WPB. Within a short time, forms CMP-5, CMP-5A, CMP-6, and CMP-8 will be released. Forms CMP-1, CMP-2 and CMP-3 should not be filled out by producers of Class A or Class B products until they have been requested to do so by a WPB industry division or by a claimant agency.

Forms CMP-1 Through CMP-8

Form CMP-1 is a summary bill of materials and form CMP-2 is a detailed summary bill of materials. Those who require Class B, Group I products must use form CMP-3. Those who wish an allotment of materials for Class A products must use form CMP-4A, and those desiring materials for Class B products must use CMP-4B. In making application for an allotment of controlled materials for construction and industrial machinery, form CMP-4C must be used. Form CMP-5 is used in making an assignment of allotment numbers and for the general authorization to purchase controlled materials. When producers pass their allotments to secondary consumers they must use form CMP-5A. The authorization form for the purchase of specific amounts of aluminum, copper and steel at mills is form CMP-6. To do away with some of the required amount of paper work under the Controlled Materials Plan, the WPB ruled on February 19, 1943 to do away with the requirement that manufacturers file form CMP-6 with all purchase orders for controlled materials. A simpler procedure for obtaining the information called for on this form is being developed. Quarterly reports on the shipment of products and inventories of critical materials must be made on form CMP-7. Beginning with the second quarter of 1943, producers of controlled materials must report their shipments and unfilled orders on form CMP-8.

CMP Regulation No. 1 Amended

Controlled Materials Plan Regulation No. 1 as amended February 8, 1943 provides that the allotments of controlled materials are to be made on a quarterly basis instead of a monthly one, as previously announced. This amended regulation has greatly simplified the method of passing an allotment number from a prime contractor to a sub-contractor. It permits the grouping of allotment numbers under major program numbers.

Warehouse Sales Under CMP

The sale of aluminum, copper, and steel by warehouses and distributors is governed by Controlled Materials Plan Regulation No. 4 issued on February 6, 1943.

CMP Consumers Allotment Accounting Manual

The WPB Controlled Materials Plan Division is releasing a Consumers' Allotment Accounting Manual to assist manufacturers in organizing the record keeping and accounting required under the Controlled Materials Plan.

Finishing Progress

If the metal finishers wish to keep posted on some of the great advances and changes which are taking place in the electroplating industry, they should visit the Conservation and Substitution Branch, Conservation Division of the WPB, located in the Washington Gas Light Building, Washington, D. C. or communicate with Dr. A. K. Graham, Chief of the Non-Metals and Industry Section, or with George Hogaboom who is head of the Plating and Finishing Unit. This war has brought to light many substitutes. Painted plywood electric lamp reflectors are replacing enameled metal reflectors. Lead coated wire and sheets have been found to be superior to zinc coated wire and sheets. Chromium plated, cyanide hardened carbon steel is said to be harder than stainless steel. After hard usage army mess plates with 0.0005" chromium plating were found to show no knife hair lines. An automotive headlamp reflector which was formerly drawn from brass, nickel and silver plated, is now being made from steel, enameled and coated with vaporized aluminum.

Electroplaters' Annual Meeting

The annual meeting and banquet of the Baltimore-Washington Branch of the American Electroplaters' Society, held at the Lee Sheraton Hotel in Washington on February 6, 1943, was a great success. Over a hundred attended the banquet, the hour of entertainment with Charles Demma as master of ceremonies, and the dancing to the tunes of Bob D'Arcy and his orchestra. For two and a half hours, before the evening of fun, with president Samuel R. Warnock presiding, three interesting and informative presentations were delivered to the members and guests of the society's branch by Gustaf Soderberg, Richard A. Dimon, and James T. Kemp.

Kemp's Remarks on Plating

James T. Kemp of the Service of Supply of the War Department presented a paper on "The Availability and Uses of Metals". Among other things, in his paper he dealt with the methods of classifying materials, and adjusting balances and needs of materials. He said cadmium plating is preferred to zinc plating. Nickel plating, he predicted, would decrease steadily until the coming of peace. Chromium plating, he asserted, would be used more extensively if it had greater protective qualities. The present high place of chromium plating, he claimed, is due to the efforts of George B. Hogaboom. The National Bureau of Standards, he mentioned, is working on a new type of plating which will withstand the hard usage of army tableware such as knives, spoons, and forks.

Dimon Discusses Electrolytic Tinning

Richard A. Dimon of the Carnegie-Illinois Steel Corporation put aside his prepared paper and delivered an informal talk on "The Electrolytic Tinning of Strip Steel," illustrated with lantern slides. One slide was a schematic diagram of the tinning steel process from the uncoilers, through the plating tanks, to the rejection and prime pilers. The other slides were photographs of actual electrolytic tinning equipment installations. In his talk he not only described some of the electrolytic tinning methods of a number of different companies, but also touched on a few uses of tinplate.

Soderberg Corrosion Test Talk

Gustaf Soderberg, director of research of the Udylyte Corporation, also put aside his paper, except to refresh his memory on some figures, and gave an informal talk on "The Properties of Plated Lead Coatings", illustrated by a dozen lantern slides with tables. The lantern slide tables presented the results of many tests of both indoor and outdoor corrosion of lead, nickel, copper and zinc in different localities and under different atmospheric conditions.

Annual Savings of Critical Materials

By means of restrictions and curtailments of production fostered by the Durable Goods Division of the WPB, an annual saving of two million tons of critical materials and a huge quantity of other essentials has been accomplished. Here are some of the estimated savings: baby carriages, strollers, and walkers, 11,000 tons of steel; dry cell batteries, 3,500 tons of zinc, several tons of copper, and significant quantities of chemicals; bicycles, 58,000 tons of steel, 15 tons of copper, 3,300 tons of rubber, 1,700 tons of lead, 579 tons of brass, 800 tons of zinc, 5 tons of cadmium, and smaller quantities of

nickel and tin; caskets and burial vaults, 650 tons of copper, 800 tons of zinc, 1,700 tons of antimonial lead, and 64,000 tons of iron and steel; church goods, 230 tons of brass, 80 tons of aluminum, and lesser quantities of tin, lead, and nickel; clocks and watches, 4,200 tons of copper base alloy, and 5,300 tons of steel; cutlery and flatware, domestic, 6,000 tons of steel, and substantial quantities of nickel, silver, copper and copper base alloys; electrical appliances, 167,000 tons of steel, 8,000 tons of copper, 5,600 tons of aluminum, 1,400 tons of rubber, 516 tons of nickel, 22,500 tons of brass, 355 tons of tin, 1,050 tons of zinc, 3,250 tons of plastics, 206 tons of chromium, and 660 tons of mica and asbestos; electric fans, 4,200 tons of steel, 500 tons of copper, 225 tons of aluminum, and 1,000 tons of zinc; electric lamps, portable, 1,000 tons of copper and about 1,000 tons of rubber; electric light bulbs, 6,000 tons of brass, 320 tons of copper, 210 tons of nickel, 110 tons of tin, 50 tons of chrome iron, and 100 tons of nickel alloy; electric ranges, 59,500 tons of iron and steel, 70 tons of nickel, and 20 tons of chromium; electric refrigerators and others, 375,000 tons steel, 18,000 tons of copper, 18,000 tons of aluminum, 4,300 tons of lead, 2,400 tons of zinc, 250 tons of nickel, 850 tons of tin, 5 tons of plastics and 4 tons of rubber; fishing tackle, 630 tons of steel, 960 tons of copper and brass, 166 tons of aluminum, 60 tons of tin, 600 tons of lead, and 45 tons of plastics; fountain pens, pen points and mechanical pencils, 2,500 tons of brass copper and steel and 400 tons of rubber; golf clubs, 1,500 tons of steel, 10 tons of aluminum, 34 tons of brass and 34 tons of lead; jewelry, 7,500 tons of brass (containing 1,400 tons of zinc), 100 tons of stainless steel, 164 tons of aluminum, and substantial quantities of other metals and materials; kitchen and household utensils, 85,000 tons of iron and steel and large unestimated quantities of other critical materials, principally zinc; musical instruments, 1,180 tons of brass, 12,210 tons of iron, 640 tons of copper, 180 tons of lead, 3,930 tons of steel, 20 tons of tin, 540 tons of zinc, and 70 tons of nickel silver; outboard motors, 1,400 tons of iron and steel, 35 tons of copper, 130 tons of brass, 60 tons of bronze, 1,090 tons of aluminum, 15 tons of rubber, 14 tons of zinc, and 11 tons of plastics; photographic equipment, 25,000 tons of carbon steel, 2,250 tons of alloy steel, 1,500 tons of copper, and copper alloys, and 1,500 tons of aluminum; razor and razor blades, 1,800 tons of steel, 1,400 tons of copper and brass and 100 tons of aluminum; sewing machines, 26,500 tons of iron and steel, 270 tons of copper, 175 tons of phenol resin, and smaller amounts of lead, nickel, stainless and alloy steel, cadmium and rubber; toys and games, 100,000 tons of steel and unestimated amounts of copper, lead, tin and zinc; vacuum cleaners, 3,000 tons of aluminum, 8,000 tons of steel, 800 tons of copper, 300 tons of brass, 175 tons of zinc, 60 tons of tin, 60 tons of nickel, 1,000 tons of rubber and 350 tons of plastics; washing machines and laundry equipment, 112,500 tons of iron and steel, 7,840 tons of zinc, 5,800 tons of aluminum, 4,700 tons of rubber, 1,700 tons of vitreous enamel, and 1,000 tons of copper and brass.

Advertising Allowances

The Office of Price Administration released on February 11, 1943 this ruling on advertising allowances: "A manufacturer is not required by the regulation to continue payments to a wholesaler or retailer for advertising services rendered, even though the method of payments may have been to allow a discount on the merchandise. The labeling of a discount as an 'advertising allowance' is not decisive of the question. If the allowance is actually a reduction of the purchase price of the commodity sold and is not dependent on the value of the purchaser's advertising services, then the seller may not discontinue it if he customarily gave such allowance prior to and during March, 1942. However, if the 'advertising allowance' was not actually that but really was a reduction in the price of the goods, the manufacturer may yet secure relief if he can meet the requirements of Section 1499.4 (b) 'special deals'. It should be noted that all 'special deals' do not constitute 'advertising

allowances'. 'Advertising Allowances' which may be discontinued are all those which compensate the wholesaler or retailer for advertising services which he performs. An allowance which contemplates simply that the purchaser will resell at a lower price would not be a payment to the seller for advertising services performed by him."

Alien Property Order 20

General Order No. 20, issued by the Office of Alien Property Custodian on February 9, 1943, prohibits any payment, transfer, or distribution of property in the process of administration by a person under judicial supervision or involved in any court or administration action, or proceeding, to or for the benefit of any person in any place under the control of an enemy country.

Alloy Ingot Prices

Maximum prices were established for brass and bronze alloy ingots by Amendment No. 2 to Maximum Price Regulation No. 202 issued on February 1, 1943. Depending upon the copper, tin, lead, zinc, and impurity contents, the prices range from 12.25 cents to 19.75 cents a pound.

Brass Buttons To Go

The War Department expects to save 365,000 pounds of brass by ordering the Quartermaster Corps to snip off brass buttons from its stock of overcoats and blouses for enlisted men and replace them with non-tarnishable olive drab plastic buttons which do not reflect light.

Church Goods Re-defined

In redefining the term "church goods" in Limitation Order L-136 as amended February 11, 1943, the use of critical materials is permitted for certain goods. In this amended order, "church goods" are divided into two classes. Class A includes all church goods which are essential in conducting religious services. Class B goods include all religious articles which are primarily decorative. *The use of lead and chromium for plating on iron and steel is now permitted in the production of Class A goods.*

Coated Abrasive Prices

Irrespective of any contract, agreement, lease or other obligation, no person is permitted to sell, deliver, receive or buy any coated or bonded abrasive product in excess of the prevailing prices of March 1942, the OPA ordered in Non-metallic Minerals Maximum Price Regulation No. 316 issued on February 8, 1943.

Copper for Alloying Gold

The Copper Division of the WPB on February 2, 1943 announced that applications for authorization to use small amounts of copper scrap and copper alloy scrap needed in alloying gold during the period covering March 1, 1943 to June 1, 1943, should apply to the Jewelry Section of the Consumer Durable Goods Division on Form PD-59. Sections I, II, III, IV, and V of this form need not be filled out. Applications for supplies for the period mentioned were supposed to be in by February 15, 1943.

Copper Division Reorganization

To simplify operations under the Controlled Materials Plan, the WPB's Copper Division has been divided into four staff sections and nine operating branches. Francis R. Kenney heads the Program Staff Section; A. R. Mosler heads the Distribution Staff Section; G. B. Holderer is acting head of the Resources Staff Section, and V. H. Arnold heads the Administrative Staff Section. The operating branches are headed by: Frank A. Ayers, Primary Production Branch; J. J. Hines, Jr., Secondary Production Branch; J. W. Douglas, Brass Mill Branch; E. H. Hammond, Jr., Wire Mill Branch; L. W. Taylor, Foundry Branch; F. R. Pyne, Mill Facilities Branch; G. P. Norton, Scrap Branch, and J. A. Wright, Copper Recovery Branch. The position of Chief of the Conservation Branch is still vacant.

Electric Motor Controller Specifications

In an effort to save about 3,500,000 pounds of copper and other critical materials, General Conservation Order L-250, dated February 13, 1943, provides that producers of controllers and parts for electric motors must conform to the simplest practical designs.

End Use Information Wanted

The Chemicals Division of the WPB in a statement issued on February 22, 1943 urged consumers of chemicals to cooperate by furnishing their suppliers with the desired information on end uses. This information is important because of the shortage of many critical chemicals and the war-time necessity of using these chemicals for the most essential purposes.

Fans and Blowers Controlled

The production and delivery of fans and blowers were placed under control by General Limitation Order L-280, dated February 16, 1943. With certain definite exceptions, this order affects all types of new devices or machines that move, compress or exhaust air by centrifugal, rotary or axial means. Under this order the manufacturer must report monthly his delivery schedule for the forthcoming two months. Previous to this order, fans and blowers were covered by the provisions of General Limitation Order L-123.

Galvanized Steel Production Concentrated

To eliminate any possible interference with the production of steel plate and hot rolled sheets, the WPB Steel Division has ordered the concentration of all galvanized steel sheet production. This measure will release the rolling facilities of several leading galvanizing sheet manufacturers for plates and heavy rolled sheets.

Lead Exemptions Removed

Conservation Order M-38-c as amended February 2, 1943, provides that orders with preference ratings of A-1-j or higher are no longer automatically exempted from the restrictions on the use of lead imposed by the order. *The restricted uses of lead of this particular order do not apply to anodes and cathodes in electroplating processes or on foil for electroplating.*

**Metals Reserve
Price Exemptions**

The Office of Price Administration on February 1, 1943 ruled in Supplementary Order 35 that the Metals Reserve Company is exempt from price control in the purchase of domestically produced strategic or critical materials.

**Metal
Strapping
Restrictions Eased**

The restrictions on the commercial use of metal strapping and wire for shipping containers on specific types of bundles were eased by conservation Order-M-261 as amended February 4, 1943. Strapping may now be used if the weight of the container and contents exceed 90 pounds, or if the net weight of the contents of the container exceeds .058 pounds per cubic inch.

**Platinum Prices
Set**

The Office of Price Administration set the maximum prices of the six 99.5 per cent pure platinum metals for the first quarter of 1943 in the issuance of Maximum Price Regulation No. 309 on January 27, 1943. The troy ounce prices established are: platinum \$35.00; palladium \$24.00; ruthenium \$35.00; rhodium \$125.00; iridium \$165.00, and osmium \$50.00.

**Power Driven Tools
Order**

The production and distribution of certain light power-driven tools, such as abrasive belt finishing machines, and disc grinding and finishing machines, were placed under strict control by General Limitation Order L-237 dated February 2, 1943.

**Silver Forms
Reduced**

The OPA has simplified and consolidated the reports required of those who use newly minded domestic silver in the production of semi-fabricated articles, including silver alloys, wire, sheet, blanks, circles, solders, brazing alloys, silver-clad metals, silver inlays, and other products. One form was eliminated and four other forms were consolidated into a simplified one according to Amendment 103 to Supplementary Regulation 14 to the General Maximum Price Regulation dated February 3, 1943. Hereafter, reports are to be made on form OPA:677:125A.

**Small Business
Regional Offices**

The Smaller War Plants Division of the WPB announced on February 1, 1943 that its 12 regional offices, headed by deputy regional directors, and its 131 district offices, have been empowered to take action on the spot. This decentralization of authority was placed in operation to enable SWPD representatives to work directly with distressed plants and with district procurement officers of the various government agencies. If anyone is in need of business, he should get in touch with one of the district offices, or with one of the regional offices located in Boston, New York City, Philadelphia, Atlanta, Cleveland, Chicago, Kansas City, Dallas, Denver, San Francisco, Detroit and Minneapolis.

SWPC Loans

Since December 15, 1942 the Smaller War Plants Corporation has granted 38 loans totaling \$2,568,770. Out of this total the *United States Plating Company of Cincinnati* received \$7,500.

**Steel Drum
Restrictions**

Beginning March 1, 1943, according to Limitation Order L-197 as amended January 29, 1943, no one is permitted to use steel drums as containers for such commodities as copper sulphate, amyl acetate, amyl alcohol, ethyl acetate, all grades of ethyl carbonate, ethyl oxalate, sodium chlorate, and potassium chlorate.

**Sulfuric Acid
Order M-257
Amended**

It is no longer necessary for producers of sulfuric acid and deliverers of spent sulfuric acid to fill out Table II of Form PD-601 according to General Preference Order M-257 as amended January 30, 1943. The WPB's Chemical Division finds that it can get from the Bureau of Census the information sought in Table II. The amended order states that fortified acid, as well as virgin acid, is included by the term sulfuric acid.

The New Nickels

The Office of War Information revealed that the government expects to save about 300 tons of nickel by eliminating nickel from the new five cent coins which are expected to be released for circulation sometime this year. Since the passage of the coinage law in December, which empowers the Treasury Department to change the metal content of the five-cent coins, considerable experimenting has been conducted by the National Bureau of Standards to produce a coin which will look like the old one, possess wearing resistance, be tarnish free, and be acceptable to juke boxes, slot machines, vending contrivances, and fare boxes. *Zinc iron was abandoned.* A silver-copper-aluminum coin was acceptable to the juke box, but it tarnished. Another experimental coin turned green. Still another experiment was rejected because the silver content was worth more than five cents. Next a silver-copper-electrolytic manganese coin was found to fill all the requirements but the WPB refused to permit the mint to use *electrolytic manganese*. The latest reports are that the new five-cent coin may be one which is made of 56 per cent copper, 35 per cent silver, and 9 per cent of non-electrolytic manganese.

**Term 'Open Tank'
Clarified**

Amendment No. 69 to Maximum Price Regulation No. 136, effective February 26, 1943, clarified the term "open tank" by adding the word "metal". The OPA regulation applies to metal open tanks and vessels and metal pressure tanks.

**Uranium Uses
Restricted**

Conservation Order M-285, dated January 26, 1943, forbids the acceptance, delivery and purchase of uranium and its compounds for use in glass, pottery, tile and other ceramic products. This order was issued to conserve supplies and stop non-essential consumption of this material which is used as a coloring agent in the making of ceramics.

"You and the War"

The Office of Civilian Defense has issued a 32-page, illustrated booklet called "You and the War". This pamphlet explains more than 100 occupations and skills which are of particular value to civilian defense organizations. Anyone interested should get a copy.

Zinc Restrictions

Remelt zinc, such as zinc material sweated or remelted from zinc scrap, including ashes, dross, skimmings, clippings, castings, engravers' plates, die castings, die cast scrap or any other secondary zinc bearing material, was placed under the same control as the six higher grades of zinc by General Preference Order M-11 as amended February 9, 1943. This order regulates the transfer and use of zinc scrap and limits the delivery of zinc by dealers to orders bearing ratings of AA-5 or higher. As under the previous order, dealers are not allowed to ship zinc to anyone who has received more than 20 tons from all sources in a month.

POLISHING, BUFFING AND BURRING COMPOUNDS ARE PLAYING A VITALLY IMPORTANT PART IN THE WAR PROGRAM

By Howard J. McAleer

President, Formax Manufacturing Co., Detroit, Mich.

WHEN the subject of final finishes for metals is discussed, grinding wheels and hones are generally thought of as the means of finishing the final product. However, in my contacts with war production plants, ranging from small tool and die shops to the industrial giants, I have found that polishing, buffing and burring compounds come into their own because they are indispensable in achieving, in mass production, the close tolerances and fine finishes demanded today. They have proven successful in tackling jobs considered impossible a short time ago.

Buffing and burring compounds enter into some stage of virtually all precision products of war, including airplane and tank engine parts, anti-tank and machine guns, bomb sight parts, rifles, torpedoes, propellers, gears, hard rubber parts and plastics. The variety of operations performed by buffing compounds is almost endless, ranging from coarse polishing operations to fine finishes that call for split-hair precision.

There are no substitutes for buffing and burring compounds when it comes to removing the last few unnecessary grams of weight on precision parts. In exposing flaws and polishing out scratches, they do a job that by any other method leads only to fatigue, strain and failure of the finished part.

Looking to the Future

Tomorrow, these same advantages will be included in post-war automotive production to produce a motor that is far superior to anything we have known in the past. Consider that the life expectancy of a fighting plane's motor today is from 600 to 700 hours compared with the 50 to 75 hours of the World War I plane. This is due, in part, to the high degree of precision going into modern aircraft engines, brought about by the use of burring and buffing compounds.

Greatly Increases Production

Many natural abrasives, such as emery, rouge, silica flint and sand-

stone, are used—as well as man-made abrasives from electric furnaces, such as aluminum oxide and silicon carbide—in the various grades of buffing and burring compounds. There is a proper buffing and burring compound available for practically any job to achieve the highest output, the best finish and the greatest economy. Tedious hand-filing work has been entirely eliminated by the selection of the proper buffing wheel and burring compound; in fact, I have seen instances where production has been stepped up as much as 500% while obtaining a finer degree of precision than was possible with hand-work.

Compounds in General Use

I am not divulging any military secret when I tell the readers of this publication about the wide variety of buffing and burring compounds I have seen on the production lines of our war plants. Because of the tremendous importance of these products to increased efficiency in our war program, I feel that a brief description of the more popular types is well in order.

Greaseless Compounds

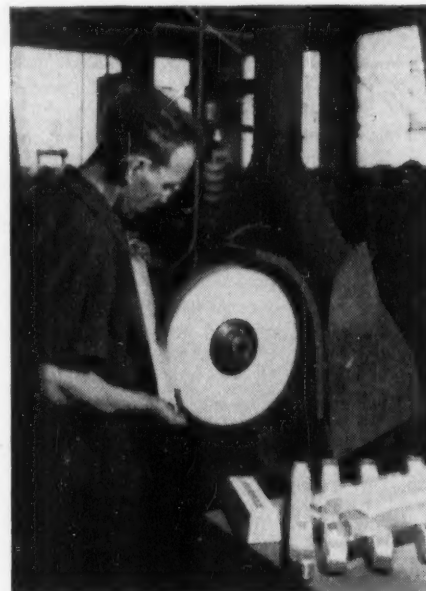
This type of material is formulated, primarily, from an animal hide glue base into which an abrasive is mixed. Other chemicals are added to keep the material in a pliable state. When applied to a revolving buffing wheel, the heat created causes the compound to melt. This deposits a coating on the wheel which immediately sets-up and dries. It can readily be seen that this compound has many uses since it may be applied on loose muslin buffing wheels to form a flexible polishing wheel, as well as on such wheels as felt when a stiffer firmer wheel is desired.

Sharp edges, burrs, tool marks and similar surface imperfections can readily be removed on a mass production basis through the use of a greaseless compound on the proper wheel. The cutting action of this compound can be

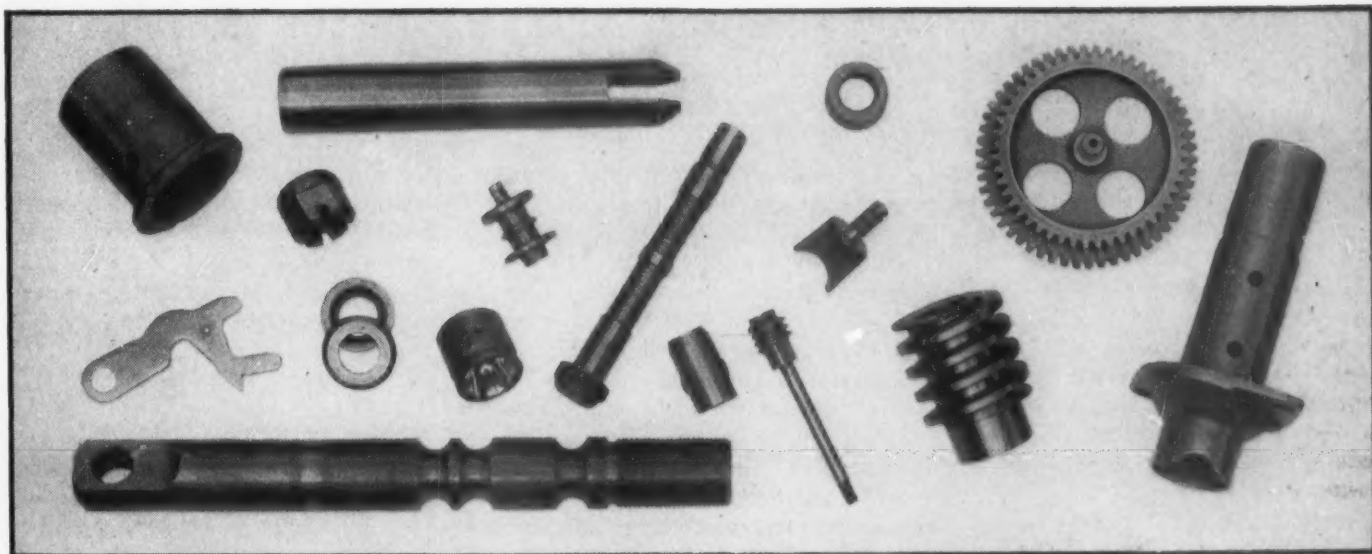
varied to suit the work simply by specifying the grain size necessary for the job and using the correct wheel speed.

Tampico Burring Compound

In many instances, the closed or solid face of the ordinary buffing wheel will not always reach the hard-to-get-at places. Because of their extreme flexibility, tampico or wire wheels are used on such applications. One difficulty previously has been the securing of a buffing compound that would cling long enough to the face of such a revolving wheel to do an efficient job. This problem has been solved. Remarkable improvements have been made in developing the proper binders to impregnate the wheel face and present a long-lasting cutting surface to the work. Of particularly noteworthy consideration is the fact that this type of compound will, in many instances, produce from three to five times the work, per application, as previous types of buffing compounds. In addition, the work is left exceptionally clean, with a semi-flat or dull finish which eliminates highlights and blends the work to a uniform color.



Buffing soft metals with white coloring compound.



Examples of machine parts which are deburred using a revolving wheel.

Chrome and Steel Coloring Rouges

These rouges are generally used to produce a higher lustre on chromium plate or steel; also for producing an extra-high lustre on stainless steel after it has first been cut down with a regular stainless steel buffing compound. This type of rouge will also produce a mirror-like finish on cast and sheet aluminum. It is generally used on a loose or spiral sewed buff.

Crocus Compounds

Used for producing a mirror-like finish on brass, aluminum, copper and other soft or non-ferrous metals, crocus compounds, as a rule, are quite dry and leave the work free from grease or smut.

Grease Stick

Grease sticks are so-called because they are generally compounded from a combination of animal fats or waxes which are used as lubricants on set-up polishing wheels. The use of a grease stick prevents the wheel from loading, in addition to imparting a smoother and brighter finish to the work. They are available in both pure white grease, as well as amber- or yellow-colored grease of various melting points which may be required on particular operations.

Stainless Steel Buffing Compounds

This type of buffing compound is generally composed of artificial flour abrasive mixed with grease binders. The cut and coloring action it gives

is dependent upon the grit size as well as the quality of the abrasive used in relation to the amount of grease binders used. Generally speaking, the more greasy the bar, the faster the cutting action. This type of compound is available for cutting out tool marks and similar surface imperfections. In most instances, it will accomplish this and, at the same time, bring the work up to a sufficiently high color. This material is ordinarily used on a spirally-sewed buff or a folded buff, depending on the type of work.

Tripoli

Tripoli compound is one of the oldest and most widely used of buffing compositions for cutting down and bringing to a high lustre such metals as copper, brass, aluminum and zinc. Tripoli is a natural abrasive of the soft, amorphous type. It is available in numerous grades from a dry, hard, cut and color compound to a straight greasy type of compound for faster cutting action.

Pumice Grease Compound

This is really a grease stick, impregnated with a good quality pumice powder. It is extensively used for blending metal parts to a uniform finish and it imparts a light, satin finish or brushed effect to the work. It has very little cutting action and is generally used on a tampico or horse hair wheel.

White Coloring Compound

Coloring compounds are so-called because they are generally used for

coloring out the soft or non-ferrous metals such as brass and aluminum. In many instances, the part being finished must first be polished on a wheel or at least cut down with a faster cutting compound such as tripoli.

If added lustre is desired, the work may be rebuffed with coloring compound. In many instances, where the work is in such condition that merely a light buffing and coloring action is needed, these coloring compounds are suitable. They are available in various grades for light or heavy work.

Plastic, Hard Rubber and Celluloid Compounds

Due to the wide variety of plastics it is difficult, in general, to recommend a buffing compound that will do the proper job. Some plastics can be brought to a smooth, bright finish by merely using soap and water on a soft wheel, while other types will require a buffing compound with an abrasive action. Most buffing compound manufacturers are in a position to recommend the proper types of material if full details are provided.

In conclusion, always bear in mind that the buffing wheel and buffing compound industry is serving a vital need in the nation's war program and that the manufacturers are eager and willing to assist in any personal metal finishing problems you may have. Feel free to call upon them at any time, without obligation, to help you.

Buy War Bonds

(Concluded from page 133)

of these extrusions, it is necessary to provide steel hooks for support. Note that these hooks do not reach the surface of the chromic acid. A method of clamping is provided to insure that the extrusions do not shift while being lowered by the crane. It is well to point out here that such long extrusions can be anodized in a tank much shorter than their length. This is accomplished by allowing the part to extend out over the end of the tank. More than half of it can be anodized in one operation and the whole procedure is repeated to anodize the opposite end.

Loading for Chromatizing

The chromatizing of aircraft parts presents much less a problem than the anodizing since chromatizing involves no electrolytic operation. It is only necessary to load the parts into baskets or sheet racks, which can be made of steel, and dip them in the various solutions. Figure 7 shows baskets and a sheet rack used for this purpose. About the only factors to remember in this operation are: first, the sheets should be kept separated so the cleaner and the acid will entirely surround the part; second, loading should be done in such a manner that no cup portions of the part will be up to drag out more solution than necessary; third, loading should be done so there are no air pockets to cause the parts to float out of the container; fourth, loading should provide for best possible drainage which will facilitate drying; fifth, the parts should not be handled with bare hands prior to the priming operation, which should take place immediately after chromatizing.

The hanging and racking of parts for processing has presented a much greater problem to the aircraft industry than is realized. Many hours of thought and work on the part of the operators and the supervisory personnel have gone into the development of quick and efficient methods of loading. Even though this article may not apply to the reader's particular problems, the basic ideas may provide him with the answer.

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Interesting Facts About Metals

By JOSEPH DANFORTH LITTLE

The earliest gas masks were used by the Romans. Pliny, who was born about 23 A.D., tells us of making mercury by heating the ore until the metal became gas which could be captured in vessels and chilled until it became a liquid. This he tells us was very dangerous, sometimes causing the workmen to lose their teeth through breathing the fumes. To avoid this hazard, the workmen always worked with their backs to the wind "so that any escaping fumes or gas might be blown away from them." They wore helmets of skin through which they could see and yet these protected their eyes as well as their lungs. These were probably man's first gas masks.

More progress has been made in the last 50 or 75 years—the golden years in metallurgy—than was made all the centuries before.

One of the world's most famous mines is the Potosi mine located in the Andes mountains. Its discovery, it is said, was due to an accident. In 1545, a poor Indian, while chasing a goat up a mountainside in the Andes, grasped a bush for support, pulled it out at the roots and discovered the huge silver lode, romantically called Potosi. From this bonanza, a Spanish adventurer later extracted millions and millions of dollars' worth of silver. No record of a reward to the Indian has ever been found.

On September 18th, 1942, the United States minted the first new five-cent pieces made of 35% silver, 56% copper and 9% commercial manganese.

On December 24th, 1942, the Treasury Department established specifications for the new one-cent zinc-coated steel coin authorized by Congress to help meet the small-coin shortage created by the wartime boom. It will be

the same size and design as the present coin, coinage of which was suspended January 1st to save copper which comprises 95 per cent of its content. Zinc is used as a coating on the new penny to prevent the steel from rusting.

The Comstock lode mines in Nevada produced on an average of \$10,000,000 worth of silver and gold each year during the 30 years following its discovery.

One of the largest gold nuggets ever found, known as "Welcome Stranger," is said to have weighed 2520 ounces, and was found in Australia. Its weight would equal that of a medium-sized man.

The weight of a cubic foot of various metals is as follows: Pure gold, 1,200.9 pounds; silver, 655.1 pounds; cast iron, 450 pounds; wrought iron, 480 pounds; steel, 489.6 pounds.

Some of the copper mines in the United States are 8000 feet, or over 1¼ miles deep.

It takes 2,000,000 pounds of copper to equip a battleship.

The O.P.A. classifies asbestos-covered copper wire as "refinery brass". Rubber, cotton, silk, glass and enamel covered wire, however, are classified as "insulated copper wire and cable".

Mercury with a purity of 99.99995 per cent required for certain applications is not a laboratory curiosity but is being produced at the rate of about 1,000 pounds per day.

Dictionary of Metal Finishing Chemicals

Arsenic Chloride: AsCl_3 . Mol. wt. 181.28. Sp. gr. 2.16. M. P. -18°C . B. P. 130.2°C . Oily, colorless liquid. Also known as Arsenic Trichloride, Caustic Oil of Arsenic, Butter of Arsenic. Decomposes in water. Soluble in hydrochloric acid, alcohol, ether. Grades: Technical, Pure, C. P. Containers: Glass Bottles, Cans (1 lb.).

Arsenic Oxide: See Arsenic Acid.

Arsenic Oxide-Penta: See Arsenic Acid.

Arsenic Oxide-Tri: As_2O_3 . Mol. wt. 197.82. Sp. gr. 3.865. Amorphous white powder. Also known as Arsenious Acid, Arsenious Oxide, Arsenious Acid Anhydride, White Arsenic, Arsenic. Sublimes when heated. Solubility, 2.0 at 25°C ; 11.5 at 100°C . Soluble in hydrochloric acid, alkalis and alcohol. Grades: Technical, 98-100% Tech., U. S. P., C. P. Containers: Bottles, Cartons (1, 5 lb.); Boxes (10, 25 lb.); Kegs (50, 100, 200 lb.); Cases (110, 220 lb.); Barrels (500, 600 lb.); Casks (500-550, 600 lb.).

Arsenic Pentoxide: See Arsenic Acid.

Arsenic Sulfide-Tri: As_2S_3 . Mol. wt. 246.00. Sp. gr. 3.4. M. P. 310°C . B. P. 707°C . Yellow or red monoclinic crystals, powder. Also known as Arsenic Trisulfide, Arsenious Sulfide, Yellow Arsenic Sulfide, Orpiment. Insoluble in cold water. Slightly soluble in hot water. Soluble in alkalis, alkali carbonates and alcohol. Grades: Technical powder. Containers: Bottles, Cartons (1, 5 lb.); Boxes; Barrels.

Arsenic Sulfide, Yellow: See Arsenic Sulfide-Tri.

Arsenic Trichloride: See Arsenic Chloride.

Arsenic Trioxide: See Arsenic Oxide-Tri.

Arsenic Trisulfide: See Arsenic Sulfide-Tri.

Arsenic, White: See Arsenic Oxide-Tri.

Arsenious Acid: See Arsenic Oxide-Tri.

Arsenious Acid Anhydride: See Arsenic Oxide-Tri.

Arsenious Oxide: See Arsenic Oxide-Tri.

Arsenious Sulfide: See Arsenic Sulfide-Tri.

This is the third installment of the dictionary of those chemicals which are particularly applicable to the metal finishing industry. This feature will continue to run regularly every month in *Metal Finishing* until the dictionary is complete.

Asbestos: Silicates with fibrous structure of calcium, magnesium, iron, sodium with and without water of crystallization.

Asphalt: Sp. gr. 1.0-1.4. Black solid and powder with conchoidal fracture. Also known as Pitch, Mineral Pitch, Petroleum Asphalt, Bitumen, Asphaltum. Containers: Solid—Pails (1 gal.); Cans (25, 50 lb.); Drums; Barrels. Powder—Cans (1, 5, 25 lb.); Barrels (100 lb.); Kegs (125 lb.).

Asphaltum: See Asphalt.

Auric & Aurous: See Gold Salts.

Azotic Acid: See Nitric Acid.

Azurite, Artificial: See Copper Carbonate.

Baking Soda: See Sodium Bicarbonate.

Banana Oil: See Amyl Acetate.

Barium: Ba. Mol. wt. 137.36. Sp. gr. 3.66. M. P. 850°C . B. P. 1140°C . Silvery metal with yellowish cast. Slightly malleable. Decomposes water with the evolution of hydrogen gas. Soluble in acids, alcohol. Grades: Technical. Containers: Iron Cans (1, 10 g; $\frac{1}{4}$, 4 oz., 1 lb.).

Barium Acetate: $\text{Ba}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot \text{H}_2\text{O}$. Mol. wt. 273.46. Sp. gr. 2.2. Colorless crystals. Decomposes when heated. Solubility, 76.4 at 26°C ; 74 at 70°C . Slightly soluble in alcohol. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Casks, Barrels (525 lb.).

Barium Carbonate: BaCO_3 . Mol. wt. 197.37. Sp. gr. 4.28. White powder. Solubility, 0.002 at 20°C ; 0.006 at 100°C . Soluble in acids and ammonium chloride solutions. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Cartons (1, 5, 10, 25, 50, 100 lb.); Boxes (25 lb.); Kegs (25, 50, 100 lb.); Bags (50, 200, 220 lb.); Barrels (300, 700, 800, 1,000 lb.).

Barium Chlorate: $\text{Ba}(\text{ClO}_3)_2 \cdot \text{H}_2\text{O}$. Mol. wt. 322.31. Sp. gr. 3.18. M. P. 414°C . Colorless, monoclinic crystals or white powder. Loses water in hydration at 120°C . Solubility, 27.4 at 25°C ; 111.2 at 100°C . Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Cans (1, 25, 50 lb.); Drums (100, 400 lb.); Kegs (112 lb.).

Barium Chloride: $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$. Mol. wt. 244.3. Sp. gr. 3.097. Rhombic, colorless crystals or white powder. Loses water of crystallization at 113°C . Solubility, 35.7 at 20°C ; 58.7 at 100°C . Slightly soluble in hydrochloric and nitric acids. Grades: Technical, Purified, C. P. Containers: Bottles, Cartons (1, 5 lb.); Boxes (25 lb.); Kegs (25, 100 lb.); Drums (100, 375 lb.); Bags (200 lb.); Barrels (400, 500, 600 lb.); Casks (800, 1,000 lb.).

Barium Chloride, Anhydrous: BaCl_2 . Mol. wt. 208.27. Sp. gr. 3.86. M. P. 962°C . B. P. 1560°C . Fine, colorless crystals. Solubility, 31 at 0°C ; 59 at 100°C . Slightly soluble in hydrochloric and nitric acids. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Barrels (500 lb.).

Barium Chromate: BaCrO_4 . Mol. wt. 253.37. Sp. gr. 4.50. Yellow, rhombic crystals and powder. Insoluble in water. Soluble in mineral acids. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Barrels, Kegs.

Barium Cyanide: $\text{Ba}(\text{CN})_2$. Mol. wt. 189.40. White, crystalline powder. Solubility, 80 at 14°C . Soluble in alcohol. Grades: Technical. Containers: Bottles (1, 5 lb.); Kegs (100 lb.); Drums (800 lb.).

Barium Dioxide: BaO_2 . Mol. wt. 169.36. Sp. gr. 4.96. M. P. 450°C . White or grayish-white powder. Also known as Barium Peroxide. Very slightly soluble in cold water. Decomposes in hot water. Soluble in dilute acids. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Cans (1, 5, 25, 50 lb.); Boxes (25, 50 lb.); Kegs (100 lb.); Drums (800 lb.); Barrels (1,000 lb.).

Barium Fluoride: BaF_2 . Mol. wt. 175.36. Sp. gr. 4.83. M. P. $1,280^\circ\text{C}$. Small, colorless cubical crystals or white powder. Solubility, 0.17 at 10°C . Slightly soluble in hot water. Soluble in acids and ammonium chloride solutions. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Boxes (25 lb.); Wooden Barrels (35, 200 lb.).

Abbreviations: Mol. Wt. = Molecular Weight; Sp. gr. = Specific Gravity; M. P. = Melting Point; B. P. = Boiling Point; Solubility figures, where given, are parts by weight in 100 parts of water; Technical = Grade usually used for industrial purposes; Purified or Pure = Better grade than technical; U. S. P. = Conforms to standards of U. S. Pharmacopoeia; C. P. = Chemically pure, exceeding requirements of the U. S. P.; N. F. = Meets requirements of the National Formulary.

Barium Hydrate: See Barium Hydroxide.

Barium Hydroxide: $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$. Mol. wt. 315.50. Sp. gr. 2.18. Colorless, monoclinic crystals. Also known as Barium Hydrate and Caustic Baryta. Loses water when heated. Solubility, 3.48 at 20° C.; 94.7 at 78° C. Slightly soluble in alcohol. Grades: Technical, Purified, C. P. (crystals or anhydrous powder). Containers: Bottles (1, 5 lb.); Boxes (10, 25, 50 lb.); Kegs (100 lb.); Barrels (500, 700 lb.); Casks (550 lb.).

Barium Monosulfide: See Barium Sulfide.

Barium Monoxide: See Barium Oxide.

Barium Nitrate: $\text{Ba}(\text{NO}_3)_2$. Mol. wt. 261.38. Sp. gr. 3.24. M. P. 592° C. Colorless, cubical crystals or white powder. Solubility, 8.7 at 20° C.; 34.2 at 100° C. Slightly soluble in acids. Grades: Technical, (crystals or powder); C. P. Containers: Bottles, Cartons (1, 5 lb.); Boxes (5, 25, 50 lb.); Kegs (100 lb.); Barrels (500, 550 lb.); Casks (800-900 lb.).

Barium Oxide: BaO . Mol. wt. 153.36. Sp. gr. 4.7-5.7. M. P. 1923° C. Colorless, cubical or hexagonal crystals or white to yellowish powder. Also known as Barium Monoxide, Barium Protoxide, Calcined Baryta. Forms the hydroxide when dissolved in water. Soluble in dilute acids, alcohol. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Steel drums (550 lb.).

Barium Peroxide: See Barium Dioxide.

Barium Protoxide: See Barium Oxide.

Barium Sulfate: BaSO_4 . Mol. wt. 233.42. Sp. gr. 4.5. M. P. 1580° C. Also known as Heavy Spar, Blanc Fixe. Known as Barytes in natural form. Insoluble in water. Slightly soluble in sulfuric acid. Grades: Technical, U. S. P., C. P. Containers: Bottles (1, 5 lb.); Cartons (1, 5, 25, 50 lb.); Boxes (25, 50 lb.); Kegs, Drums (100 lb.); Barrels (250, 350, 600 lb.).

Barium Sulfide: BaS . Mol. wt. 169.42. Sp. gr. 4.3. Yellowish green, black or gray powder. Also known as Barium Monosulfide. Decomposes in water. Grades: Technical, Purified, C. P. black (70%); gray (80%); yellow (85-90%). Containers: Bottles, Cans (1, 5, 10, 25, 50 lb.); Drums (100 lb.); Casks (500 lb.); Barrels (400 lb.).

Baryta, Calcined: See Barium Oxide.

Baryta, Caustic: See Barium Hydroxide.

Baryta, Water: Solution of barium hydroxide.

Barytes: See Barium Sulfate, natural form.

Battery Acid: Special grade of sulfuric acid, water-white, odorless and practically free from iron. Made by diluting the highest grade of commercial acid with water to Sp. gr. 1.210 (28.5% sulfuric acid) or to Sp. gr. 1.400 (50.07% sulfuric acid). Another commonly used strength Sp. gr. 1.835 (93.19% sulfuric acid) is prepared by dissolving pure sulfur trioxide in water in fused silica equipment. Although the above three strengths are standard, any strength can be furnished. See Sulfuric Acid.

Bay Salt: Solids contained in sea water, mainly sodium chloride. Produced by atmospheric evaporation of sea water. Containers: Bags (5, 100 lb.).

Beeswax: Sp. gr. 0.961-0.968. Brown to light yellow or white wax. Pleasant odor. Solidifies between 60.5-62° C. Soluble in alcohol, ether, acetone, etc. Grades: Crude, Refined, U.S.P., Sun-bleached, Lumps, Cakes. Containers: Cartons (1 lb.); Bags (1, 5, 25 lb.); Cases; Kegs (100 lb.); Barrels (300 lb.).

Benzene: C_6H_6 . Mol. wt. 78.108. M. P. 5.48° C. B. P. 80.08° C. Also known as Benzol, Phenyl Hydride, Coal Naphtha. Colorless, inflammable liquid. Very slightly soluble in water. Infinitely soluble in ether, alcohol, acetic acid, toluol. Grades: Crude, Purified, U.S.P., C. P. Containers: Bottles (1, 5 lb.); Cans (1, 5 gal.); Drums (55, 110 gal.); Tank cars.

Benzenetriol—1, 2, 3: See Pyrogallol Acid.

Benzine: See Petroleum Ether (This is not the same as Benzene).

Benzoic Acid: $\text{C}_6\text{H}_5\text{COOH}$. Mol. wt. 122.118. Sp. gr. 1.2659. M. P. 121.3° C. B. P. 249.2° C. White scales or colorless monoclinic leaf or needle-like crystals. Also known as Phenylformic Acid. Solubility, 0.27 at 18° C.; 2.2 at 75° C. Soluble in alcohol, ether, carbon tetrachloride, chloroform, acetone, methyl alcohol, benzene, carbon disulfide. Grades: Technical, U. S. P., C. P. Containers: Bottles (1, 5 lb.); Cartons, Cans (1, 5, 25 lb.); Kegs (50 lb.); Barrels and Fiber Drums (100, 150 lb.).

Benzol: See Benzene.

Benzol 160°: See Naphtha, Solvent.

Beryllium: Be. At. wt. 9.02. M. P. 1350° C. Sp. gr. 1.85. Hard, grayish-white metal. Also known as Glucinum (Gl). Insoluble in cold water. Slightly soluble in hot water with decomposition. Soluble in dilute acids and alkalis. Grades: Technical-fused; Powder. Containers: Bottles (1 g., 1 lb.); Boxes.

Beryllium Sulfate: $\text{BeSO}_4 \cdot 4\text{H}_2\text{O}$. Mol. wt. 177.14. Sp. gr. 1.71. Tetragonal, colorless crystals. Loses water of crystallization at 100° C. Completely dehydrated at 250° C. Solubility, 43 at 25° C. and 100 at 100° C. Grades: Technical, C. P. Containers: Bottles (¼, 1, 5 lb.).

Bicarbonate of Soda: See Sodium Bicarbonate.

Bismuth. Bi. At. wt. 209.00. Sp. gr. 9.80. M. P. 271° C. B. P. 1450° C. Brittle, white, crystalline metal with reddish tinge. Insoluble in water. Soluble in nitric acid, hot sulfuric acid, aqua regia. Slightly soluble in hot hydrochloric acid. Grades: Technical, C. P., Lumps, Bars, Powder, Granulated Sticks. Containers: Bars (25 lb.); Bottles; Cans (1, 5 lb.); Boxes (25, 100, 150 lb.).

Bismuth Carbonate: See Bismuth Subcarbonate.

Bismuth Chloride: BiCl_3 . Mol. wt. 315.37. Sp. gr. 4.75. M. P. 230° C. White, deliquescent crystals. Also known as Bismuth Trichloride. Decomposes in water to form Bismuth Oxychloride. Soluble in acids, alcohol, acetone. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Kegs.

Bismuth Nitrate: $\text{Bi}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$. Mol. wt. 485.10. Sp. gr. 2.8. Triclinic, colorless crystals. Slightly hygroscopic. Also known as Bismuth Trinitrate. Decomposes when heated and when dissolved in water. Very soluble in nitric acid. Soluble in acids and acetone. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Cans (25, 50 lb.); Kegs.

Bismuth Nitrate, Basic: See Bismuth Subnitrate.

Bismuth Oxide: See Bismuth Trioxide.

Bismuth Oxycarbonate: See Bismuth Subcarbonate.

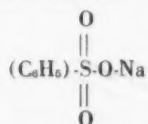
Abbreviations: Mol. Wt. = Molecular Weight; Sp. gr. = Specific Gravity; M. P. = Melting Point; B. P. = Boiling Point; Solubility figures, where given, are parts by weight in 100 parts of water; Technical = Grade usually used for industrial purposes; Purified or Pure = Better grade than technical; U. S. P. = Conforms to standards of U. S. Pharmacopoeia; C. P. = Chemically pure, exceeding requirements of the U. S. P.; N. F. = Meets requirements of the National Formulary.

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

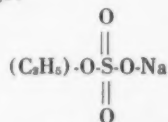
Sulfates and Sulfonates

Question: At various times I have come across the terms "sulfate" and "sulfonate" in connection with organic materials which are used as brighteners and as wetting agents. Are sulfates and sulfonates the same thing or are they different chemicals?—J. C.

Answer: Organic sulfates and organic sulfonates are different chemicals. However, some confusion has resulted due to the practice in certain quarters of using the term "sulfonate" to cover both groups. The fundamental difference between the two is the linkage to the carbon atom of the organic base. In the case of sulfonates, the carbon is attached directly to the sulfur atom of the sulfonate; whereas in the case of sulfates, an oxygen atom is interposed between the carbon atom and the sulfur atom of the sulfate. As examples, sodium benzene sulfonate will look as follows:



while sodium ethyl sulfate will have the following linkage:



It will be noted above that there are three oxygen atoms in the sulfonate radical while there are four in the sulfate radical.

Rubber Anodes

Question: I wish to deposit hard rubber on a brass rod using flat victrola records as anodes. Any information you can give me will be appreciated.—H. M., Jr.

Answer: Flat victrola records are not made of hard rubber and even if they were, they could not be used as anodes for rubber deposition. Rubber is usually electrodeposited at the anode from a latex solution.

Frosting Glass

Question: Enclosed find two samples of glass we are frosting on the inside with which we seem to be having some difficulty at times. We do not know what to attribute this to. The frosting comes out very well as you will see in Sample No. 1 and then it comes out as shown in Sample No. 2. The formula we use for the frosting is hydrofluoric acid—40 parts by weight (60% acid), ammonium bifluoride—30 parts by weight, sodium carbonate—10 parts by weight, water—15 parts by weight. Will you please let us know if this is the proper formula?—

M. I. Co.

Answer: The improper frosting on the samples may be due to dirty glass or, more probably, to insufficient dispersion of the ingredients of the solution.

It is absolutely necessary to neutralize most of the excess hydrofluoric acid in the mixture before using. When preparing the etch, the salts should be dissolved in water before the hydrofluoric acid is added. It should then be left standing overnight before using.

Most etching formulas call for ammonium carbonate in addition to the sodium carbonate and we suggest that you try the following:

Hydrofluoric acid	40 parts
Ammonium bifluoride	30 "
Ammonium carbonate	10 "
Soda ash	5 "
Water	15 "

Protective Wax

Question: We would appreciate your advising us the kind of wax you recommend for use on polished bronze plates to keep them from tarnishing. It may be that you can tell us how to make this up.—S. P. Co.

Answer: We suggest that you write advertisers in *Metal Finishing* who are prepared to supply protective waxes and other coatings which would be suitable for the purpose. Today such materials are being used extensively to protect steel parts and parts finished with black coatings of the chemical displacement type from rust and corrosion.

Polishing Compounds

Question: Can you inform me what binder is used for fine rouges, such as aluminum oxide or chromic oxide? If wax, what kind? If stearic acid, which type? If a mixture, what proportions? I am a subscriber to *Metal Finishing*.—S. M. L.

Answer: There is no single formula for polishing compounds which will serve all purposes. There are literally hundreds of mixtures on the market, each of which has been found best for a particular application and has been developed as a result of trial and error. The usual ingredients of polishing compound binders are double pressed stearic acid, mutton tallow, tallow stearine, mineral oil, rosin, beeswax, paraffin and other waxes, and wetting agents. Different proportions of each are used, depending on the type of composition required—that is, free rinsing, greasy, dry, hard, soft, fast cutting, etc.

Examples of buffing compositions can be found in a booklet entitled "*Buffing Compounds*" which was issued by E. I. Du Pont de Nemours & Co., in 1937.

Pickling Accelerators

Question: We have been referred to you for information concerning an accelerator to use in commercial hydrochloric acid for cleaning scale from castings after heat treating. Any information you can give us in this matter will be greatly appreciated.—

M. C. Corp.

Answer: There are two types of materials used in hydrochloric acid pickling solutions—namely inhibitors and wetting agents. Wetting agents are used because of their ability to lower the surface tension of the solution which permits the pickling bath to wet the surface of the metal uniformly. This results in a more uniform pickling job. Wetting agents for this purpose must satisfy two requirements. They must be stable in acid solutions and must not be salted out by the iron which dissolves during the pickling operation.

Inhibitors in acid pickling result in preferential attack of the acid on the scale so that the scale is removed with only very slight attack on the basis metal. This minimizes etching and pitting of the metal and also results in an appreciable saving in acid. Because of patent restrictions we are unable to advise you on suitable materials to be used as inhibitors but a search of the patent literature will disclose most of the details.

Substitute for Rhodium

Question: As you know, no rhodium is available for the production of non-tarnishing coatings on jewelry at present. Can you inform us of any possible substitute which we can use without restriction? Practically all of our work is of repair nature on different types of jewelry.—L. T. C., Inc.

Answer: There are only two metals on the non-restricted list which are commercially suitable for the production of a white, non-tarnishing electrodeposit. These are palladium and chromium. Palladium can be deposited over most metals and although some users in the past have considered the darker color of this metal objectionable as compared to rhodium, they now have no choice except between using palladium and shipping the merchandise without any tarnish-resistant coating. Chromium may be satisfactory for plating on white gold, but on sterling silver and on tin alloys, the deposit is not bright but milky, and requires polishing, which is rather difficult on intricate jewelry.

Hot Galvanizing

Question: I am now zinc plating malleable iron castings and understand that this same type of fitting is required with a hot galvanized coating. We have small fittings and would like to do them in baskets, if possible. We also have fittings with a very fine thread. Would hot galvanizing harm the thread in any way? Kindly help me out with as much information as possible or advise me where I can receive such information on hot galvanizing.—B. R.

Answer: We do not believe that hot galvanizing will be satisfactory on articles with very fine threads, as the threads will load up with zinc and will have to be reched after galvanizing. We know of no reason why electrodeposited zinc should not be used instead of hot galvanizing.

Small parts can be handled in baskets for hot galvanizing but the articles should be spread out on a tray before the zinc coating solidifies in order to avoid sticking together. If a centrifugal device can be hooked up, the basket filled with parts can be spun after removal from the zinc bath. This will result in a more uniform coating without heavy edges or beads.

For information on the hot galvanizing process, we suggest that you communicate with the American Hot-Dip Galvanizers Association, Inc., 903 American Bank Building, Pittsburgh, Pa.

Information Desired

We have received requests from subscribers for information on three processes. One is called "Ferrites", pronounced Ferritees; another is called "Tearlition Bath"; the third, the "Thermostatic Dye or Die" process.

If any reader has come across any of these names, we shall be glad to hear from him.—Ed.

Pickling Steel

Question: Our problem is the removal of a heavy coating of rust on various sizes of nuts and bolts. We use a 50% cold solution of 18° muriatic acid. We would like to know what readily obtainable material we can use in our solution as an inhibitor to accelerate the action of the acid on the rust while at the same time retarding reaction on the steel bolt itself.

Our facilities for up-to-date equipment are limited. For this reason, we are unable to use anything but a cold solution. Our processing line is in the following order: one tank containing a hot solution of trisodium phosphate for cleaning, degreasing, and loosening some of the rust; one tank for a hot water rinse; a tank for the pickling solution; one for another hot water rinse; the final bath contains oil to add a film of protection.

Any suggestions concerning a neutralizer between the acid rinse and the final oil bath would be very much appreciated. We have had so many suggestions offered us in connection with our system that it all adds up to general confusion.—D. S. Co.

Answer: Addition agents for hydrochloric acid pickling may be obtained from companies advertising such products in this magazine. Standard steel mill practice consists of the use of a suspension of lime in the rinse after pickling to neutralize any residual acid and to leave an alkaline film on the surface of the steel. It is suggested that you use this procedure. If it will not react with the oil in your final bath, the lime should be placed in that bath preferably so that the hot rinse after the pickle will remove most of the acid first.

Cleaning Burnishing Balls

Question: We have been burnishing white metal in a tubbing barrel with steel shot and now the shot is all dull looking. Can you tell us of a way to clean the shot and produce the original bright color?—D. Mfg. Co.

Answer: The shot can be cleaned by tumbling in a hot solution containing about 1 lb. of caustic soda and 2 oz. of sodium cyanide per gallon of water. This solution cannot be used in a tubbing barrel because of the wood tank and brass cylinder panels, but a way out of this difficulty is to put part of the shot in a large Mason jar or in a steel can with a cover and pour in enough of the above solution to cover the shot. A hole should be punched in the cover to allow gases to escape. The jar or can is then attached to the inside of one of the panels of the tubbing cylinder by means of strong twine or wire which is strung through the perforations in the panel. The machine is then operated for a few hours and since the jar is off center, the shot will tumble around and brighten.

Cadmium Solutions

Question: I am sending you two samples of cadmium solution, which I would like you to analyze. They plate dark and not so bright. Can you suggest a good brightener and method of analysis for cadmium? Hoping you will help me out of a spot.—"Bill".

Answer: The analyses of your solutions are as follows:

	#1.	#2.
Metallic cadmium.....	4.5	4.5 oz./gal.
Total cyanide.....	14.3	12.9 "
Free cyanide.....	6.5	5.1 "

The free cyanide contents should be brought up to 9 oz./gal. which will require the addition of 2.5 oz./gal. of sodium cyanide to the #1 tank and 4 oz./gal. to the #2 tank.

The dark deposits may be due to insufficient brightener or, more probably, to impurities in the solutions. The addition of small amounts of cadmium sponge will help remove metallic contamination such as copper, lead, etc. If the source of contamination is removed, it will be found that the impurities in the solution will be eliminated during the course of operation of the solution. Brighteners for cadmium plating can be purchased from companies advertising bright cadmium processes in *Metal Finishing*. We suggest that you write them for details, as the brighteners are all patented.

Methods of analysis of cadmium plating solutions will be found in the 1941 Edition of the *Plating & Finishing Guidebook*, published by Metal Industry Publishing Co., Inc.

Bright Finishing

Question: What type of finish would you recommend for jewelers' lathes (a small lathe about one foot long)? They carry a good priority number and were being bright nickel-plated, but this finish is no longer permitted due to the scarcity of nickel.

Would bright zinc be satisfactory for such a job, or would it discolor and tarnish? We would like very much to have a bright finish.—S. P. & P. Works.

Answer: Bright zinc plating will require a subsequent lacquer coating to prevent discoloration of the zinc but the resistance to rusting will be excellent. Special lacquers are required for adherence to zinc and you can write lacquer companies which advertise in *Metal Finishing* for the proper type. If the bright dip finish of zinc is not suitable, the zinc deposit may be buffed to a mirror luster before lacquering.

Since your requirements probably are for a finish which is as hard as nickel in addition to being bright, there is no substitute which will be as cheap or as suitable. Heavy chromium or palladium deposits may be used if cost is not a factor. Both these metals are non-tarnishing and hard.

Patents

Corrosion Prevention of Iron

U. S. Pat. 2,303,242. R. R. Tanner & R. V. Harris, assignors to Parker Rust Proof Co., Nov. 24, 1942. The method of producing a corrosion-resistant paint-holding coating integral with the metallic surface which comprises drying onto a ferrous surface a film of an aqueous solution containing chromic acid and phosphoric acid, in which the ratio of chromic to phosphoric is not more than 0.15 to 1.

Example:

Phosphoric acid	10.0%
Chromic acid	1.5%
Duponol WA paste	0.5%

Apply to the surface with a brush. Dry in an oven for 3 minutes at 300° F. The solution may be heated to facilitate the reaction and hasten drying.

Coloring Aluminum

U. S. Pat. 2,303,350. W. A. Fuller, Dec. 1, 1942. A dilute aqueous solution for producing a black coating on aluminum made up from a mixture of a selenium compound which produces a selenous acid and a soluble halogen salt of copper.

Example:

Selenium dioxide	5 g.
Cupric chloride	5 g.
Water	500 cc.

Corrosion Prevention of Iron

U. S. Pat. 2,304,299. C. L. Boyle & M. D. Sclar, said Sclar assignor to said Boyle, Dec. 8, 1942. A composition adapted to be applied to a ferrous metal surface prior to painting comprising a water solution of phosphoric acid and a wetting agent, which wetting agent is selected from the group consisting of organic phosphates and organic phosphonates.

Example:

75% Phosphoric acid	5-15% by volume
Sodium salt of myristyl phosphonate	0.1-2% by weight

Corrosion Prevention of Magnesium

U. S. Pat. 2,305,669. N. Budiloff & W. Schnabel (Germany), vested in the Alien Property Custodian, Dec. 22, 1942. The method of producing hard and compact protective coatings on objects of magnesium and magnesium alloys, which comprises subjecting the object to be coated to electrolysis in a bath consisting substantially of an aluminate electrolyte and an addition selected from the group consisting of the soluble phosphates, arsenates, and fluorides of the alkali metals and maintaining said bath at a temperature between about 15° and about 30° C.

Example:

Sodium aluminate	5%
Sodium fluoride	3%
Trisodium phosphate	5%
Room temperature. 120-150 volts alternating current. 1.5 amp./sq. dm.	

Tarnish Prevention of Tin

U. S. Pat. 2,306,143. A. E. Stevenson, assignor to Continental Can Co., Inc., Dec. 22, 1942. In the art of establishing a surface condition on tin plate capable of permanently resisting sulfur-staining of the tin plate and maintaining the same of new-bright appearance under the influence of food products contacting the tin plate, the step of treating the tin plate before contact of said products therewith by the action of a hot aqueous solution containing substantially 0.86% trisodium phosphate on the anhydrous basis for a time not essentially exceeding 2 minutes, and then thoroughly rinsing the tin plate before contact with said products.

Chromium Bath

U. S. Pat. 2,307,551. J. J. Triska, assignor by direct and mesne assignments, to Triskalite Corp., Jan. 5, 1943. An electroplating bath for use in electrodepositing chromium electroplatings constituted principally of chromium and cadmium in amount effective to producing a white, platinum-like deposit comprising a solution containing chromic acid, a chromium plating catalyst comprising an acid radical in amount sufficient to deposit conventional bluish chromium electroplating commercially, an effective amount up to about 1% of lead and antimony and an amount of modifier up to about 30 g./L. adapted to make possible the addition of increasing amounts of cadmium and at least 13 grams to about 160 grams of cadmium per liter, said bath having been pretreated by passing a current between an anode and a test cathode immersed therein at a current density of about 0.5 to 2.5 amp./sq. in. at a potential difference of about 5 volts for a period of time varying from a fraction of an hour to several hours until the test plate shows a white, platinum-colored electrodeposit of chromium substantially devoid of bluish and purplish hues and capable, only after such pretreatment, of electrodepositing white, platinum-like chromium platings substantially devoid of bluish and purplish hues.

Example:

Chromic acid	300 g./L.
Sulfuric acid	3 cc./L.
Cadmium oxide	20-45 g./L.
Electrolyze at 80-110° F. at 5 volts until test strips show that a platinum-like color is obtained. Operate the solution at about 40-110 amp./sq. ft. and 4-6 volts with a temperature of 80-110° F.	

Degreasing

U. S. Pat. 2,310,569. W. E. Booth, assignor to Imperial Chemical Industries, Ltd. (England), Feb. 9, 1943. A process for solvent degreasing in which a water layer is maintained above the solvent in the degreasing chamber, the temperature of the water being maintained below its boiling point but above that of the azeotropic mixture of water and solvent, and withdrawing articles treated in the solvent bath through the water layer.

Buffing Wheel

U. S. Pat. 2,309,553. V. J. Twynning, F. G. Cyrex & A. H. Losey, assignors to J. C. Miller Co., Jan. 26, 1943. A buffing wheel comprising two spaced apart discs, buffing means between said discs extending outwardly beyond the peripheries thereof, spacing means between said discs, a hub on one of said discs extending toward the other disc and cooperating means on said hub and said other disc to reasonably secure said discs together.

Galvanized Steel

U. S. Pat. 2,309,801. N. P. Veeder, assignor to Granite City Steel Co., Inc., Feb. 2, 1943. The improvement in the process of manufacturing galvanized sheet steel which consists in producing a slab of low carbon steel containing more than 0.12% but less than 1.5% of silicon, converting said slab into a ductile sheet having the preferred orientation of its iron crystallites characteristic of severely worked steel, and dipping said sheet in molten zinc.

Galvanizing Apparatus

U. S. Pat. 2,310,162. E. A. Matteson, assignor to The Aetna Standard Engineering Co., Feb. 2, 1943. An apparatus of novel design including a galvanizing pot, feed and exit rolls and other devices for galvanizing metal sheets.

Iron Anode

U. S. Pat. 2,310,561. M. G. Whitfield, assignor to Reynolds Metal Co., Feb. 9, 1943. A combined electrolytic container and electroplating anode for use in the electrodeposition of iron and for consumption during the plating operation, including a relatively long narrow cast iron tank having relatively thick walls and a depth suitable for the suspension of a sheet-like cathode in the electrolyte containing in said tank and a width approximately equal to 4 inches plus the thickness of the cathode, said tank having its walls reduced in thickness above the level to be assumed by the electrolyte therein to minimize overhanging edges as the iron of the anode is consumed.

Brazing Flux

U. S. Pat. 2,308,801. J. K. Anderson, Jan. 19, 1943. A flux consisting of an alkali acid fluoride, an alkali boroformate and at least one halogenide selected from the class of metal halogenides, alkali metal halogenides and alkaline earth metal halogenides.

Example:

Potassium acid fluoride	50%
Sodium boroformate	30%
Cuprous chloride	5%
Sodium chloride	5%
Potassium chloride	5%
Strontium chloride	5%

Strip Treating Apparatus

U. S. Pat. 2,311,616. R. H. Gordon & R. P. Tooke, assignors to The American Rolling Mill Co., Feb. 16, 1943. An apparatus for treating metal strip consisting of tanks and a baking oven and means of conducting the strip in sequence into said tanks and oven.

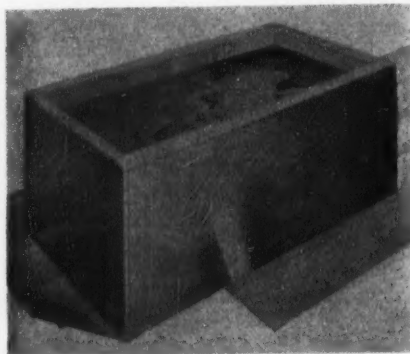
NEW EQUIPMENT AND SUPPLIES

NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY

New Cartridge for Respirator

The American Optical Company of Southbridge, Mass., announces a new air-filtering cartridge for its R-1000 respirator. The new-type AD cartridge protects lungs against a combination of all types of dusts, including toxic, pneumoconiosis-producing, and nuisance dusts.

The face-piece of the AO R-1000 respirator contains a compartment into which a cartridge can be inserted, seven of which have now been designed for interchangeable protection against common respiratory hazards faced by industrial workers.



Glass Tank

Pittsburgh Plate Glass Co., 2033-3 Grant Building, Pittsburgh, Pa., now offers glass tanks.

Glass has many properties making it particularly desirable for chemical tank purposes. It is non-absorptive and non-porous. It won't rot or contaminate any of the chemical solutions it may hold. And it has recently become possible to so temper it as to render glass sufficiently strong and resistant to thermal shock to classify it as a permanent container to handle acids, alkalis and other chemicals.

Illustrated is a typical, all-glass tank of the free-standing variety. It can be made of opaque structural glass or transparent plate glass. The Pittsburgh company also provides glass linings for tanks made of other materials.

Safety Extension Light

Adding to its line of specialized safety equipment for industry, the Davis Emergency Equipment Company of 45 Halleck Street, Newark, N. J., has designed a new safety extension light which is said to be absolutely safe against electric shock, even when the guard is removed.

The light has a guard of heavy fibre and a new type of spring contact exclusive with the Davis Company. The light is so designed that the guard serves as the on-and-off switch. When it is unscrewed the current is automatically cut off.

The light is made of materials said to be strong enough to eliminate the need for repairs and replacements. The entire device is made of non-conductive materials, removing the hazard of electrical shock and the danger of short circuits. Bulbs are replaced quickly since the guard is removed without the use of tools.

Synthetic Rubber Mountings

Announcement has been made by The B. F. Goodrich Company, Akron, O., that its line of Vibro-Insulators (rubber mountings) can now be made using its Ameripol synthetic rubber. These mountings, which are used for the isolation and insulation of vibration, shock and noise, have been offered for many years using natural rubber bonded to metal.

Vibro-Insulators made of Ameripol synthetic rubber are expected to find wide application in many fields of war industry where the action of oils, grease, paint, fatty acids or heat result in too-rapid deterioration of natural rubber used on mountings.

Most all B. F. Goodrich Vibro-Insulators, whether made of natural rubber or synthetic rubber, are designed to carry the load in shear, because rubber in shear is known to have six times the resiliency of rubber in compression.

Industrial Gloves for Women

Edmont Manufacturing Co., 586 Orange St., Coshocton, O., manufacturers of rubberized fabric gloves, have announced a new glove for women workers which is claimed to offer complete hand protection against solvents, acids, chemicals, caustics and other corrosive materials.

These gloves are reinforced with a fabric lining said to make them virtually snag-proof and tear resistant. They are comfortable on the hands, easy to put on and take off and flexible. They are gauntlet in type and come in two women's sizes, medium and large.



Women's Gloves

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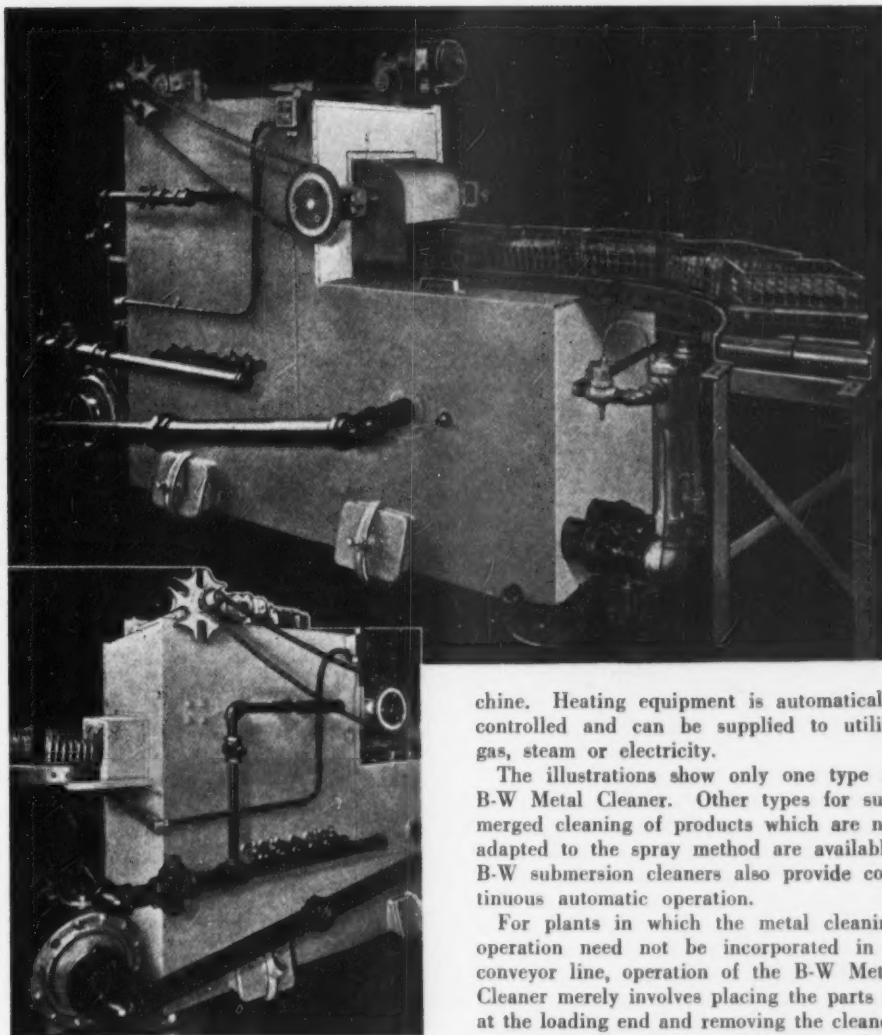
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New Washing Machine

The photograph above is an example of a B-W Metal Cleaner showing the loading end and the discharge end.

The variety of shapes and sizes of objects which this cleaner will handle is almost limitless. Small parts are usually carried through the machine in the same baskets which are used throughout the remainder of the process of manufacture. Large parts are carried individually on suitable conveyors.

Parts are conveyed through the machine and subjected to powerful sprays of cleaning solution of suitable strength and temperature. If necessary, parts can be completely dried before emerging from the machine. Alkali or solvent type cleaners may be employed. Skimmers allow for continuous or periodic removal of contamination from the cleaning solution. One push-button controls the entire operation of the machine.

Industrial Dermatitis Protection

Announcement of new, industrial skin creams and lotions for barrier protection of the worker's skin against industrial dermatitis, of interest to industrial medical directors, safety engineers, and plant executives concerned with checking the problem of industrial dermatitis and keeping men and women on the job without loss of time and production, is made by Mine Safety Appli-

chine. Heating equipment is automatically controlled and can be supplied to utilize gas, steam or electricity.

The illustrations show only one type of B-W Metal Cleaner. Other types for submerged cleaning of products which are not adapted to the spray method are available. B-W submersion cleaners also provide continuous automatic operation.

For plants in which the metal cleaning operation need not be incorporated in a conveyor line, operation of the B-W Metal Cleaner merely involves placing the parts in at the loading end and removing the cleaned parts from the unloading end nearby. It is said that one man can easily wash 9,000 small parts per hour in this manner.

The Barry-Wehmiller Machinery Company has a staff of sales engineers who will assist in developing a complete layout to secure maximum efficiency of all operations involving metal cleaning. Or, if preliminary information by mail is preferred, the following data should be furnished:

1. Samples, blueprints or dimensional sketches of parts or articles to be cleaned.
2. Samples, blueprints or dimensional sketches of baskets, if used.
3. Nature of the material to be cleaned from the article.
4. Desired capacity per hour.
5. Points in the process at which cleaning is desired.

A bulletin describing the machine and a typical floor layout may be obtained by writing Barry-Wehmiller Machinery Co., 4660 W. Florissant Ave., St. Louis, Mo.

ances Co., Braddock, Thomas and Meade Sts., Pittsburgh, Pa.

These creams and lotions, trade-named "Fend," are stated to provide a protective barrier on the skin against many specific hazards in industry. Consisting of cosmetically-safe materials, the creams are said to be medically correct, easy to apply, emollient and readily removed with mild soap and warm water.

Protective Coating for Steel Coils

A new protective coating material designed especially for use on steel coils in rustproofing systems has been developed by Michigan Chrome and Chemical Co., 6340 East Jefferson Ave., Detroit, Mich. This material, known as "Koilkote," is claimed to provide the means to save hours of time usually spent in removing deposits and to lengthen the useful life of the coils.

In ordinary practice, the coils in rustproofing systems which are in constant use must necessarily be removed and cleaned approximately every two weeks. To remove the deposits it has been customary to pound with a sledge, with the obvious possibility of damaging the coils—a method which ordinarily requires almost a full day of a man's time.

The makers of Koilkote claim that users of their product clean the coils no more than once in five or six weeks, the actual cleaning time being less than an hour. Since deposits do not form as heavily or as quickly on the protective coating, there is little appreciable difference in the heating efficiency of the coils between cleaning periods. It is said that Koilkote is quickly applied and, although it adheres firmly to the steel surface, it and the deposits which form on it are easily removed.



Sprays on . . . peels off!

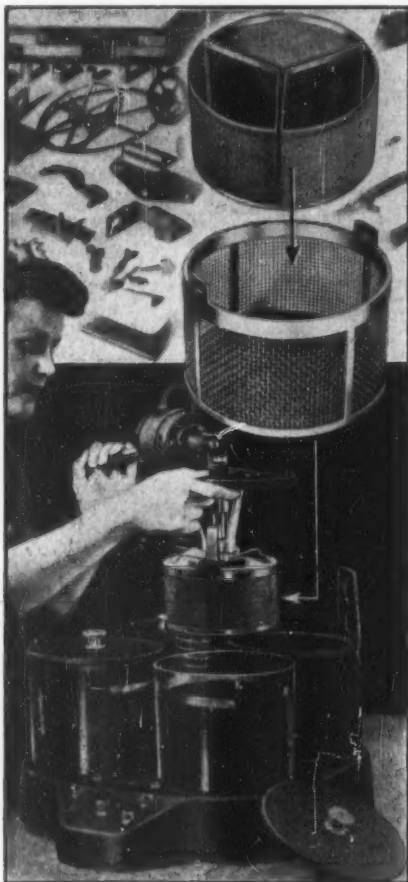
Spray Mask for Aircraft Plastic Glass

Adhere, Inc., 1220 Maple Ave., Los Angeles, Calif., for ten years in the business of producing adhesives for display advertising, and, since the war, devoted entirely to production of edge-gummed masking paper and special insignia masks, has announced "Adhere Spraymask" a new, waterproof, protective and abrasion-resistant mask for plastic glass bomber noses and windshields which simply sprays on . . . and peels off.

The mask is applied with an ordinary paint spray gun, and afterwards may be peeled off in a sheet, as shown in the illustration. Major aircraft companies who have been experimenting with its use have found it particularly adaptable for spraying formed plastic glass parts such as bomber noses and gun turrets, for protection until the plane is on the line ready to fly.

Although primarily used by aircraft plants, the material has many, as yet unexplored, uses in other types of production requiring a temporary protective mask or coating against paint, grease, abrasion, wind, or weather.

The protective film afforded by this mask is tough enough to prevent abrasions and ordinary scratches during the assembly process and is resistant to paint for masking purposes. Said to be waterproof, it has no chemical action on the plastic and is impervious to paint thinners and ordinary solvents. When dry, it not only peels off neatly in a sheet, but actually tends to clean the surface.



New Baskets for Industrial Cleaning Machine

It is now possible to clean different types of parts individually and run them through the L & R Industrial Cleaning Machine at the same time.

A new triple basket has been devised which fits snugly into the regular work basket (3 $\frac{3}{8}$ " deep x 5 $\frac{1}{2}$ " diam.) of the machine, and being made of fine mesh will hold minute parts without danger of their slipping through the mesh and becoming mixed with other elements.

This is particularly important to producers of jewels, jewelled bearings, ball bearings, quartz crystals, instruments, meters, watches, clocks, and others who manufacture parts which must be examined for cleanliness under microscopes. The triple nesting baskets are also important for cleaning three larger parts which the operator desires to handle individually. Because of the centrifugal action of the basket in the cleaning compounds there is no danger, once contamination has been removed, of foreign matter returning into the basket and affecting other parts.

L & R machines, baskets and solutions are products of L & R Manufacturing Company, 54 Clinton St., Newark, N. J.

Application for Temperature Control and Safety Protection

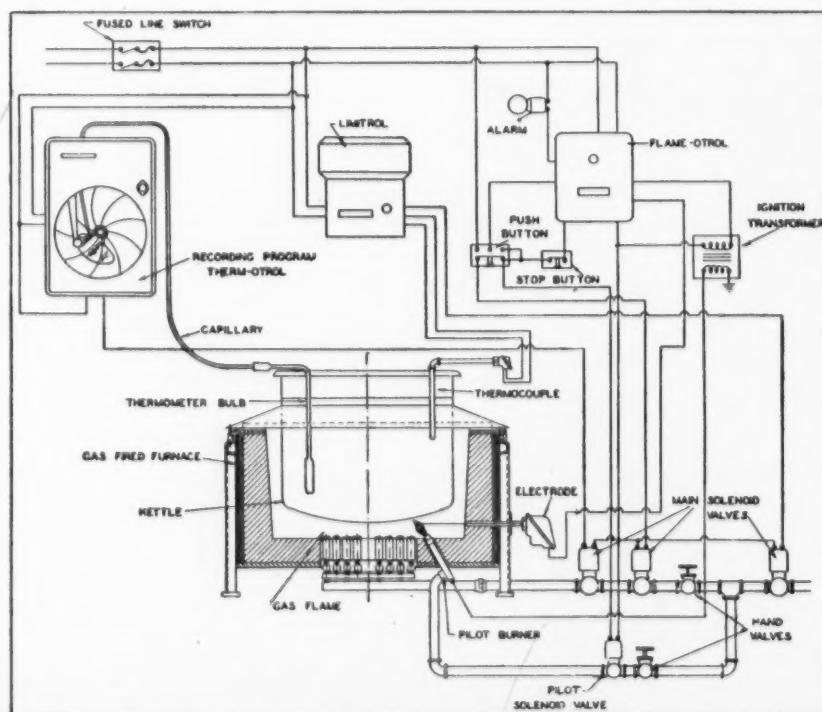
An automatic temperature cycle or program control application for salt bath heat treatment, a pot-type furnace or a processing kettle, incorporating excess temperature shut-off and combustion explosion protection, is illustrated in the accompanying schematic drawing prepared by engineers of Wheelco Instruments Co., Harrison & Peoria Sts., Chicago.

The instrument installation is designed to control fuel so as automatically (1) to provide the desired temperature at any period in the process regardless of temperature variations required; (2) to provide a record of temperatures experienced during the cycle; (3) to give excess temperature shut-off protection and protection against burning materials with low flash points, or in the event of fuel valve or instrument failure, and (4) to eliminate combustion hazards. It may be applied to gas- or oil-fired equipment.

The thermometer bulb of a "Recording Program Therm-otrol" is suspended in the furnace or kettle. When the "Therm-otrol" calls for heat, a solenoid valve, shown schematically in the main fuel line just before the main burner, releases fuel that is ignited by a continuous pilot burner. When temperature has reached the level called for at that period in the process, the "Therm-otrol" closes the solenoid valve. The main burner goes out, but the pilot burner remains ignited.

Protection against pilot failure, which would present an explosive condition with ignition failure since the "Therm-otrol" called for heat, is obtained through a Wheelco "Flame-otrol". This instrument employs the ability of a flame to conduct a current. An electrode is mounted so that one end is in contact with the pilot flame. The pilot flame completes a circuit, which, should it be interrupted, would cause the "Flame-otrol" to close a main line solenoid valve, shown in the drawing second from the burner, and another solenoid valve in the pilot burner by-pass line. An alarm bell advises the operator when fuel is shut off.

Protection against possibility of valve or control instrument failure upsetting a process or treatment by overheating, or by heating above the flash point in the case of some materials, is obtained by a Wheelco "Limitrol". This instrument, set a few degrees above the highest temperature called for in the process or treatment, is actuated through a thermocouple suspended in the furnace or kettle. If this excessive temperature is reached, the "Limitrol" closes a solenoid valve in the main fuel line, shown in the drawing at the extreme right, instantly stopping fuel flow to both main and pilot burners. When fuel is cut off by the "Limitrol," operation of the equipment cannot be resumed until temperature of the material is reduced to a point below the "Limitrol" setting.



Manufacturers' Literature

Bulletins on Automatic Control Instruments for Industrial Furnaces, Kilns, and Ovens

The Bristol Company, Waterbury, Conn., has published a series of bulletins covering automatic control and recording instruments for industrial furnaces, dryers, kilns, and ovens. These have been bound together in loose-leaf form in order that additions and revisions may be easily inserted.

The binder set covers pyrometer recorders and controllers, thermometer recorders and controllers, humidity recorders and controllers, draft controllers, control valves and accessories.

The bulletins included are illustrated with photographs, application drawings, and wiring diagrams, and the material included gives a wide selection of types and combinations to meet the needs of manufacturer or user.

Rubber Development Advertisements

The 1942 edition of its "Typical Examples of B. F. Goodrich Development in Rubber" has just been published by The B. F. Goodrich Company. It consists of reproductions of 26 advertisements during the last year. Copies are available upon request to the company's principal headquarters in Akron, Ohio.

Parting Compound

A four-page illustrated bulletin, No. 422-AE, on the use of "dag" colloidal graphite as a parting compound has just been released by the Acheson Colloids Corp., Port Huron, Michigan. This bulletin discusses "dag" colloidal graphite for screw threads, lamp bulbs, its application to aviation and deep sea diving equipment and also its use in the glass and rubber industries and in the foundry.

Buyers Directory

Metal Industry Publishing Co., 11 West 42nd St., New York, N. Y., have published the 1943 revised edition of the "Buyers Directory."

This directory lists alphabetically all the equipment and supplies required by the metal plating and finishing industry, from abrasion testing equipment to zinc ribbon. It is primarily intended for the use of purchasing agents and shop executives.

Chromium Plating

A new booklet, illustrating the application of chromium plating in the fabrication of metals, is available upon request from United Chromium, Inc., 51 East 42nd St., New York, N. Y.

Salvaging of parts and production tools, increasing corrosion and wear resistance of gauges and metal forming and working tools are discussed.

Stop Off— for all plated metals

Now you can stop off any plated metal either in acid or alkaline solution . . . Just two BUNATOL quick drying chemical resistant Stop Offs will meet every plating need . . . No. 474 RED for hard Chromium and any acid solution . . . No. 608 BLACK for cyanide Copper, Tin, Silver, Zinc or any alkaline solution.

Easy to apply; brush, dip or spray . . . Fast drying . . . Great adhesion and easy to remove . . . Trims easily and holds on the trimmed edge . . . No plate through . . . Not toxic . . . May we send you samples? . . . Just write . . .

NELSON J. QUINN COMPANY
TOLEDO, OHIO, U. S. A.

BUNATOL

Equipment for Accident Prevention

Cooperating with the President's five million dollar "must" campaign for the further prevention of industrial accidents, Catalog No. 50, containing 144 pages of which 134 pages are devoted to safety equipment and 10 pages to an index, has been released by The Boyer Campbell Company, 6540 Antoine, Detroit, Mich.

Included are descriptions of hundreds of products that take in various phases of the safety problem. Some of the subjects covered are face and head protection, women's protective apparel, guards, safety tongs, clothing, gloves, vapor-proof magnifying lights, etc.

New developments, since the publishing of the last catalog, are included in this edition.

"K Monel"

The International Nickel Company, 67 Wall St., New York, N. Y., has released a bulletin on the engineering properties of "K Monel".

This booklet contains sections on the cleaning and pickling of this metal.

Electrocleaning Process

MacDermid, Inc., Waterbury, Conn., have issued a colored folder, featuring a return post card, describing "The Anodex Process" as a new method of electrocleaning steel and copper buffed parts prior to finishing operations.

Anodex is an odorless, white, alkaline powder claimed to have 100% solubility in hot water.



PRODUCTION LINE METAL CLEANING and PICKLING....

FOR STEEL SHELL CASES

Above: The first cleaning and pickling machine built for the new steel shell cases—a pickling, washing, neutralizing and sulfurized tallow coating machine for 37mm shell cases prior to drawing. Capacity 3000-5000 lbs. per hour.



Write now for your copy of this new metal cleaning handbook—the first complete manual on materials, methods and machines for metal cleaning.

*Calls for the Right
Machines, Methods
and Materials!*

Effective cleaning at mass production rates is just as dependent on adapting the cleaning material and method to a particular operation as it is on the design of a special washing machine properly geared into the production line.

MAGNUS OFFERS YOU ALL THREE — PLUS

- 1: A complete line of specialized metal cleaners
- 2: Years of research in the development of cleaning methods
- 3: Wide experience in designing and building special metal washing machines to meet individual requirements.

PLUS: Quick service, particularly in delivery of machines. If you want to speed production and solve man-power shortages by fitting your cleaning operations into the production line, call on Magnus for the complete, coordinated service that insures quick results and better cleaning.

MAGNUS CHEMICAL COMPANY

Manufacturers of Industrial Cleaning Materials—Washing, Drying, Pickling Equipment—Metal Drawing Lubricants, also Methods Engineering Service.

11 South Avenue

Garwood, N. J.

SERVICE REPRESENTATIVES IN ALL PRINCIPAL CITIES



MAGNUS CLEANERS

Protection of War Shipments Described

Shippers of many items will be interested in issue No. 9 of "Acme Process News." This 12-page house organ of Acme Steel Co., 103 Park Ave., New York, N. Y., reveals how many types of war and civilian products are protected in transit for safe arrival at far flung destinations. Life rafts, paper, metal parts, landing field mats, planes, tractors and machine guns are some of the shipments which are described in this issue.

Solders

"Solders That Stand Up" is a folder in which substitute solders, regular solders and Alpha service in solving solder problems, are described. The Lead-Tin Fusion graph on the back page is valuable in handling solder difficulties due to the tin shortage.

This folder is published by the Alpha Metal & Rolling Mills, Inc., 363 Hudson Ave., Brooklyn, N. Y.

Zinc Coated Sheet Metal

A booklet containing fresh information on "Armco Zincgrip", and helpful suggestions on specifying, ordering, fabricating and finishing it, has just been published by The American Rolling Mill Co., 750 Curtis St., Middletown, O.

The file-size, 26-page booklet is designed to assist purchasing agents, engineers, plant executives, foremen and workers in using this special zinc-coated sheet metal, which is defined as "a greatly improved sheet metal with a unique zinc coating that does not peel or flake when the metal is severely formed." Photomicrographs comparing the "Zincgrip" coating with a conventional galvanized coating visualize why this sheet metal takes severe forming without damage to the protective zinc.

Special sections deal with specifying, ordering, physical properties, deep drawing, roll forming, brake forming, welding (metallic arc, carbon arc, oxyacetylene and spot), cleaning and recoating welded joints, soldering and finishing.

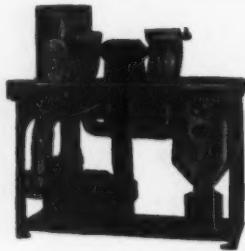
Cleaning Units

Colt's Patent Fire Arms Manufacturing Co., Hartford, Conn., are the publishers of a 12-page booklet illustrated with diagrams and photographs of their various machines for washing, rinsing and drying.

Both conveyor and revolving models are reviewed.



Blower



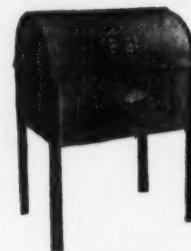
Polishing Bench



Dryer



Tubbing



Sawdust Box



Sandblast

THE BOLAND SYSTEMS FOR FACTORY INSTALLATIONS

Tanks, Coloring Rooms, Dynamos, Sawdust Boxes

H. J. ASTLE & CO., INC.

Established 1884

(Send for Catalogs)

118 Orange St., Providence, Rhode Island

Technical Publications

A.S.T.M. Standards on Soaps and Other Detergents

A special compilation, issued February 1, 1943, of all the specifications, methods of analysis, and definitions developed by Committee D-12 on Soaps and Other Detergents of the American Society for Testing Materials, gives all these standards in their latest form. Committee D-12, with leading technologists representing producers and consumers of soaps and detergents, has developed 15 specifications and two methods of analysis for soaps and soap products, seven purchase specifications and four analytical methods for special detergents.

The specifications for soap cover bar, chip, powdered, salt water, solid, toilet, and other kinds of soap, while other standardized specifications apply to the following detergents: soda ash, caustic soda, metasilicate sodium, trisodium phosphate, and others.

To make the first edition of this publication more valuable there are included proposed methods of analysis of industrial metal cleaning compositions, and an extensive annotated bibliography on aluminum cleaning.

Copies of this 140-page publication can be obtained from A.S.T.M. Headquarters, 260 S. Broad St., Philadelphia, Pa., at the following prices: 1 to 9 copies, \$1.35 per copy; 10 to 49 copies, \$1.10 each.

Data on Corrosion Resisting and Heat Resisting Steels

The new Tables of Data on Chemical Compositions, Physical and Mechanical Properties of Wrought Corrosion-Resisting and Heat-Resisting Chromium and Chromium Nickel Steels published in December, 1942, by the American Society for Testing Materials have been under development for many months by Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel and Related Alloys. Messrs. Franks and LaQue carried out the work for the committee, with data contributed by a number of manufacturers and users of stainless steel. An effort has been made to give the data in condensed form and to cover material in widest commercial usage.

The first part pertains to wrought chromium steels, 4 to 6 per cent, 8 to 10 per cent chromium, etc., while the second part covers wrought chromium-nickel steels up to 25 per cent chromium, 20 per cent nickel. All told there are 21 extensive but compact tables and 26 charts and curves covering important data such as chemical composition, physical properties, forging and heat treating practices, and mechanical properties of steels. There is information on creep characteristics and short-time tensile properties. This latest publication is the third in the series on stainless steels issued through the work of the A.S.T.M.—the first two having been published in 1924 and in 1930.

Copies of the 44-page pamphlet can be obtained from the A.S.T.M. Headquarters, 260 S. Broad St., Philadelphia, Pa., at \$1.25 per copy.



THERE'S NO SECOND PRIZE in the Battle for Production!

When the mailed fist of War threatened American production facilities no less than our fighting forces, among the first to accept the challenge was the Metal Finishing Industry.

How well knowledge and ingenuity were pitted against our common enemies can never be completely told until Victory Day. That's when the record will speak for itself.

Problems involving the application of metal finishing methods to war purposes are many and complex. If you are extending the ways in which metal finishing is serving our armed forces, you may have need of the broad practical finishing knowledge represented in McAleer Men, Methods and Materials. We'd like to be of real assistance.

There's No Second Prize in the Battle for Production!

Let's fight and work together! If War needs have put a premium on your finishing results, you can reach your production objective with a "tailored-to-fit-the-job" McAleer product. Write us. We'll be glad to furnish the details and characteristics of our *Quality-Controlled* Finishing Materials. Better yet, send samples of work together with an outline of the finish you desire. We'll follow through—but quickly!



Zinc in Wartime

"Zinc in Wartime" is the name of a new booklet containing few statistics but hundreds of photographs, most of them official army and navy pictures. These photographs, together with the accompanying text, describe the many military and essential civilian uses to which zinc is put today.

Few realize the importance of zinc in the war effort. It is believed "Zinc in Wartime" will prove interesting and informative not only to those closely allied to the industry, but to the public generally.

Copies may be obtained free of charge upon written request to the *American Zinc Institute, Inc.*, 60 East 42nd St., New York, New York.

Production Control for Fuller Use of Manpower and Machines

In the interest of furthering war production and promoting employment stabilization within individual companies, the Policyholders Service Bureau of the *Metropolitan Life Insurance Co.* has recently issued a report entitled "Controlling Factory Production." This study is based on the practices of 44 manufacturers operating in a wide variety of industries who are believed to represent a cross-section of sound management practices.

Copies of the report are available upon request to the company's New York office, at 1 Madison Avenue, New York City.

GEORGE A. STUTZ MFG. CO.

Distributors of the Finest

LEA Burring, Buffing, Polishing Compositions

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BLACKENING PROCESSES FOR ALUMINUM—
STEEL — ZINC — COPPER
ACID ADDITION AGENT
ENAMEL STRIPPERS

OIL-DRI — THE PERFECT, NON-ABRASIVE OIL AND
GREASE ABSORBENT

OIL-DRI is a granular compound that absorbs oil and grease. It leaves floors dry and clean. It offers welcome relief to thousands of industrial plants, repair shops, service stations, grease pits and other spots where oil and grease-soaked floors are an ever present threat of destructive fire and wasteful, costly accidents due to falls.

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TAMPICO BRUSHES — SHEEPSKIN — RAG — CANVAS
COMPLETE EQUIPMENT AND SUPPLIES FOR
PLATING AND POLISHING

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Tumbling and Burnishing

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PERMAG

Cleaning Compounds
Speeds Production

PERMAG Burnishing and Tumbling Compounds produce a high finish on metals, cleaning effectively in the same operation. Hand polishing and buffing of brass, aluminum, steel, etc., are eliminated when burnished and tumbled with PERMAG Compounds. Using the tumbling barrel decreases cleaning time on small steel parts and brightens them very effectively.

Write for details, or let us send our representative.

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MAIN OFFICE: 59 COURT ST. BROOKLYN, N. Y.
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Associations and Societies

American Electroplaters' Society

Annual Convention

Plans for the annual convention of the American Electroplaters' Society are going along with the approval of the O.P.M. which has endorsed the convention as essential to the war effort.

The Fellowship Club Open House will take place Monday evening, June 7th, the first of the three-day convention. The Monday afternoon session will be held at 2:30 with the Fellowship annual luncheon taking place at noon the same day.

The Victory Luchon, as inaugurated at the Grand Rapids Convention, will be held Tuesday with Dr. Hodge speaking.

Cincinnati Branch

The Regional Dinner Meeting of the Cincinnati Branch of the AES is scheduled for Saturday, March 27th, at the Hotel Gibson in Cincinnati.

Two speakers are scheduled, one of them Mr. Davidson from Detroit who will give advice on the de-burring of steel and alloy metal parts. The other talk will be devoted to analysis and special metal finishing.

Free beer will be served. Tickets, costing \$2.50 each including the price of the dinner, may be ordered from A. L. Forman, Box 313, R. R. 9, Cincinnati, Ohio.

New England Regional Session and Banquet

The committees have been formed for the annual New England regional session and banquet to be held at the Hotel Bond, Hartford, Conn. on May 1st. They are as follows: Educational—Waterbury Branch; Advertising—Bridgeport Branch; Publicity—Springfield Branch; Tickets—New Haven Branch; Hotel and Entertainment—Hartford Branch.

The educational session is to feature a metal finishing clinic with experts in all phases of war finishing participating. Clarence Helmle is to open the program and act as moderator throughout the session.

Arthur W. Logozzo, General Chairman, writes that the entertainment program will feature talent new to platers' meetings and that two bands—one civilian and one recruited from an army post—are to provide music for dancing.

Los Angeles Branch

The Los Angeles Branch of the American Electroplaters' Society will hold its ninth annual educational session at the Elks Temple, Sixth and Parkview Sts., Los Angeles, Saturday, March 20.

The program will consist of an educational session, with morning and afternoon business sessions, and the annual dinner and

ball in the evening. No products exposition will be held this year.

Speakers will include the following: *Dr. Herbert Waterman*, professor of chemistry, University of Southern California, Los Angeles; *B. G. Daw*, president, Lasalco, Inc., St. Louis, Mo.; *T. E. Coyne*, director of research, United Chromium Corp., Detroit, Mich.; *Manuel Sanz*, process engineer, Vultee Aircraft Co., Downey, Calif.; *Harold Acker*, chief chemist, W. P. Fuller Co., Los Angeles; *Marcus Rynkofs*, general chairman of the arrangement committee, also announced that tentative arrangements had been made to have a talk given by *P. W. Strasser* of the Bureau of Standards, Washington, D. C.

The educational program of the February 1 meeting of Los Angeles Branch, A.E.S., held in the Elks Temple, featured an extemporaneous discussion on problems of changing from a cadmium to a zinc plating set-up, with *Robert Gripp*, head of *Cadmium Nickel Plating Co.* of Los Angeles, leading the discussion.

Stating that control of the solution is one of the vital points in successfully converting from cadmium to zinc, Mr. Gripp said that in using a high current in his shop he obtained considerable roughness on the surface of material, whereas a lower current produced a satisfactory surface.

"Keeping the solution in proper balance," Mr. Gripp emphasized, "is the secret of good work. We cannot get away with the carelessness of the past. While cadmium, on the whole, costs more money, the labor cost is cheaper because a cadmium tank requires very little attention as compared with a zinc tank. But, under present labor conditions, I cannot see how things are going to be much cheaper, either way."

One of the essentials of bright zinc plating, Mr. Gripp declared, is to put on a pure zinc by purifying and repurifying the material before it is placed in the tank. The solution, he emphasized, must be absolutely free of heavy materials, such as lead, copper and cadmium. He warned that it is necessary to clean tanks properly which have been used for cadmium work before converting them for use with zinc.

Some discussion on the job stabilization program which went into effect in Southern California in January was held. *President Emmette R. Holman* and *Earl Coffin* of the board of managers explained that electroplating shops are directly affected because workmen engaged in finishing of metals are listed among the "essential" classification of the War Manpower Commission.

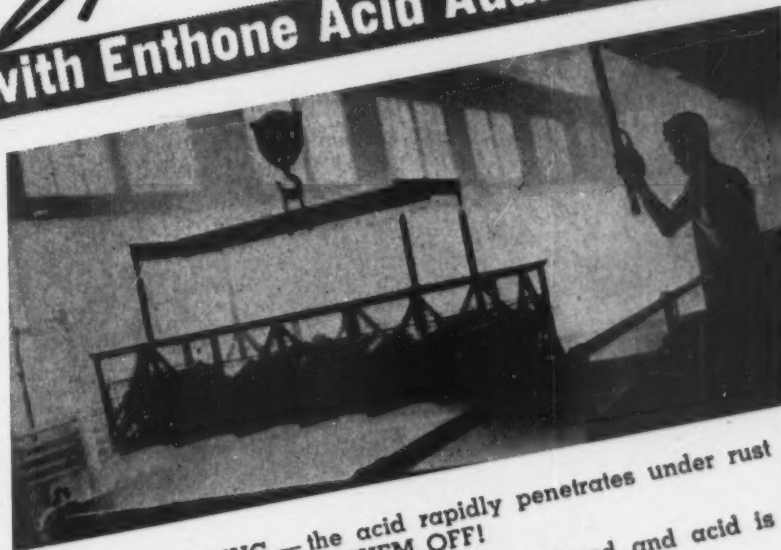
Marcus Rynkofs presented a report of the activities of the committee which is arranging details of the annual educational session to be held March 20. He reported that nearly 200 reservations for the annual dinner and ball had already been received, assuring success of the affair despite the fact that wartime conditions made it necessary to eliminate the exhibit of metal products which had been a feature of previous annual sessions.

Arch Pevely and *Gilbert J. Vontz*, both employed by the National Supply Co., Los Angeles, were accepted into membership in the associate classification.

Speed

ACID PICKLING the DOUBLY SURE* Way

with Enthone Acid Addition Agent



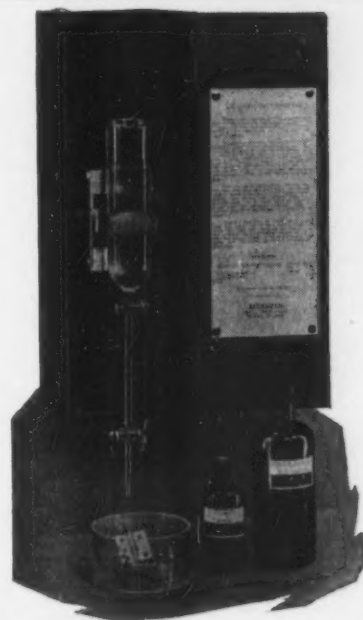
★ **FASTER PICKLING** — the acid rapidly penetrates under rust and scale, thus **LIFTING THEM OFF!**

★ **SAVES ACID** — Drag-out is materially reduced and acid is saved by inhibiting action.

OVERCOMES WATER-BREAK IN PICKLING — Due to poor alkaline cleaning or soap in the alkaline cleaner, water-breaks appear on acid dipping before plating. The use of **ENTHONE AAA** in the acid literally makes the acid a cleaner and overcomes peeling due to faulty cleaning.

Write today for **FREE Trial SAMPLE** and valuable informative **BULLETIN**

THE Enthone COMPANY
NEW HAVEN CONNECTICUT



ZINC

SOLUTIONS & DEPOSITS

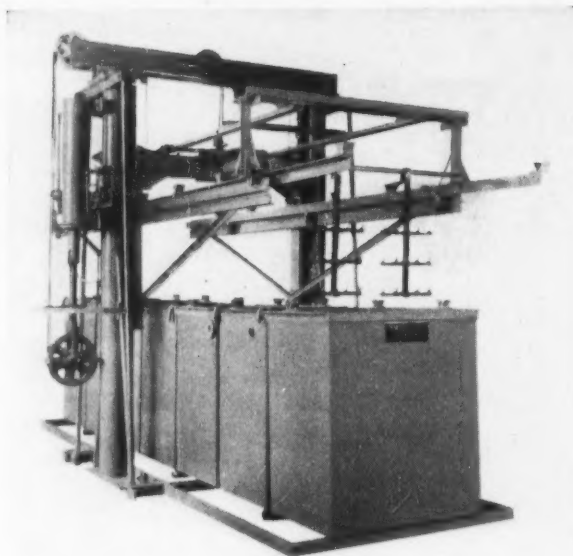
Controlled with simple direct reading test sets.

Sets for other solutions and deposits also available

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Crown Pick-up Unit



...MACHINE...

A UNIT TYPE TRANSFER CAPABLE OF
HANDLING SEVERAL TANKS
AT ONE TIME.

...USE...

FOR A SERIES OF OPERATIONS WHERE THE WORK
MUST PASS THROUGH SEVERAL TANKS, AS
THE CLEANING AND RINSING OPERA-
TIONS, FOR A SEMI-AUTOMATIC
PLATING TANK.

CROWN RHEOSTAT & SUPPLY CO.
1910 MAYPOLE AVENUE :: :: CHICAGO, ILLINOIS



BLACK-MAGIC

"The one bath process"

Is now being used coast to coast on numerous
Ordnance and other Government applications.

BLACK-MAGIC plus WITCH-DIP (a rust-resisting wax base final dip)
is being used on millions of bottle crowns.

BLACK-MAGIC plus clear lacquer is an accepted finish for Bomb fuse
ogives and steel cartridge cases.

BLACK-MAGIC Zinc Black for die castings and zinc-sheet fabrications.

MITCHELL-BRADFORD CHEMICAL CO.

STRATFORD P.O.
BRIDGEPORT, CONN.

News From California

By Fred Herr

Approximately 4500 workers in the Los Angeles area engaged in the finishing of metal products are affected by the job stabilization program set up by the Southern California Area War Manpower Committee, effective January 18. The program was evolved after three months of planning by labor representatives, employers and government officials, and affects a total of about 1,000,000 workers in the 30 divisions in Los Angeles County.

It is estimated that approximately 3,000 workers are employed by the 363 independent shops in the area, while some 1500 others are connected with large defense plants which operate their own metal finishing, polishing, plating and metal treating departments. "Finishing of metal products" was one of the 30 major divisions of workers listed as "essential" and affected by the plan.

The purpose of the plan is to restrict undue migration of workers and eliminate excessive turnover of job holders. It provides that workers designated as being engaged in essential industries may change jobs only if they have a certificate of availability. Jobs can only be given when the certificate is produced. Such certificates will be issued to workers seeking new jobs only when a change in employment is "... in the best interests of the war effort."

Entrance of women workers into the plating and finishing field in the Los Angeles area has not been so extensive as in some other industries. Estimates are that between 12-15% of plating shop personnel now is composed of women, with the percentages varying in different cases. Robert Sripp, operator of an independent shop in Los Angeles, stated that 18 of his 80 employees are women; another shop operator said the ratio in his plant is 5 out of 24; another, 6 out of 30.

Crown City Plating Co., 165 S. Fair Oaks Ave., Pasadena, has an extensive expansion program under way for handling chromium, zinc and anodizing work on aircraft parts and radio and communication equipment.

The firm has leased a 75 x 150 foot building adjacent to its main plant, in which the painting and chromatizing departments are being concentrated. Chromium and paint equipment are being moved from the main shop to make room for new anodizing facilities.

The new painting equipment includes two spray hoods and two ovens for baking wrinkle enamel. The chromium department contains two steel lead-lined tanks with inside water jackets for hard chromium work on aircraft parts.

A new anodizing tank is being installed in the main building. The firm's first zinc equipment also is being set up there, including two steel-constructed zinc tanks for use on aircraft parts for which the army specifies zinc.

Ray Bray, plating shop foreman, stated the company is doing considerable magnetic inspection on aircraft parts, using a magna-flux machine to detect interior defects.

Bowers Manufacturing Co., Inc., 7600 Avalon Blvd., Los Angeles, metal stampers, has installed a new Lasalco full automatic 8,000 gallon Dupont bright zinc tank for plating rings and tops of shell cases; also a 5,000 amp. Chandeysson generator and a 2,000 amp. General Electric rectifier.

Bedwell Plating Co., Los Angeles, has installed a new zinc solution setup with a 350 gallon Dupont tank.

Stanley T. Marcyam has established the *Arrow Metalcraft Co.* at 6115 S. Wilmington Ave., Los Angeles.

R. G. Herbst, operator of Santa Barbara's only plating plant—*Herbst Plating Co.*—made his semi-annual business and pleasure visit to Los Angeles on February 1 and took advantage of the occasion to attend the A.E.S. meeting. Mr. Herbst has been a member of the Los Angeles branch since shortly after its founding in 1929.

Herbst Plating Co., he reported, confines itself chiefly to gold and silver work. At present the firm is handling a considerable volume of plating on army officers' insignia.

United States Spring & Bumper Co., 1124 S. Los Angeles St., Los Angeles, which operated one of the largest plating and finishing departments in the city before the war, has accomplished one of the major conversion tasks among Southern California industrial plants.

The plating department has been converted to the needs of armor plate work on which the company now is engaged. Grinding and polishing are the principal operations required, for which reason the plating department has been virtually dismantled. Most of the plating equipment has been lent out for the duration of the war to other firms engaged in defense manufacturing and requiring such equipment.

Articles of incorporation have been issued to *Armco Metal Products, Inc.*, Los Angeles, a Delaware corporation capitalized at \$300,000. *Joseph C. Cannon*, 510 S. Spring St., Los Angeles, is the California representative.

Heat Treated Materials, Inc., have received papers of incorporation for operation in Los Angeles. Directors are listed as *C. F. Degele* of Long Beach, Calif., and *Allen Stone* and *R. H. Gordon* of Los Angeles.

Universal Die Casting Co. has been established at 5001 Santa Ave., Los Angeles by *Samuel S. Yedor* and *L. M. Horwich*.

Frank P. Denman has opened for business under the name of *Du-Lite Rust Proofing Co.*, at 3245 Figueroa St., Los Angeles.

Other new firms established recently in Los Angeles and vicinity include the following:

G. T. Air-O-Metal Co., 918 Forest Grove St., *E. Monte*, *Lester G. Gilbert* and *Samuel W. Turner*.

Industrial Chemical Supply Co., 2326 East Fifth St., Los Angeles; *W. L. Randolph*.

Ace Tool & Die Co., 928 N. Formosa St., Los Angeles, *Edward* and *Franklin Phillips* and *George Pflug-Felder*.

Glo-Dial Clock Co., 188 W. Washington Blvd., *C. W. Hoffritz*.

Richard Laboratories, 808 N. Highland Ave., Hollywood; *E. O. Weeks*.

CHROMIC Acid

99.75% PURE

With two complete, independent plants at Jersey City and Baltimore, and its own supply of the basic raw material Chrome Ore from company owned and operated mines, Mutual is the world's foremost manufacturer of Chromic Acid.

BICHROMATE OF SODA
BICHROMATE OF POTASH

Mutual Chemical Co. of America
270 MADISON AVENUE, NEW YORK



4A CEMENT and THINNER A Substitute for Glue. NO WORRY ABOUT GLUE SHORTAGE WITH 4A CEMENT AND THINNER. Polishing wheels are free cutting, long lasting and economical when set up with 4A Cement.

COLORING ROUGES UNIFORM, CAREFULLY GRADED RAW MATERIALS, EXPERTLY COMPOUNDED BY HARRISON'S TECHNICIANS, INSURE ROUGES THAT GIVE HIGH LUSTER AND FAULTLESS FINISHES.

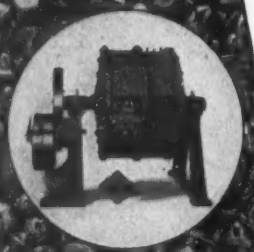
POLISHING COMPOUNDS 4A symbolizes these four features which you require for high speed polishing, mirror finishing of all kinds of steel, including stainless steel, carbon steels and hard-to-buff alloys. Use it on any kind of a wheel, soft, medium or hard.

Tell us your problem and samples of compounds, rouges or cement will be sent. We will be pleased to recommend proper methods.

"AMPLE STOCKS TO TAKE CARE OF OUR TRADE"



HARRISON and COMPANY
Haverhill, Mass.



Cutting Corners
 for Top Speed Production

Rounding corners or removing burrs by grinding or filing is too slow and costly to meet today's demands for speed and economy.

Barrel finishing has solved many such problems. Write to us about yours and send a few unfinished samples of your small, metal parts. We'll gladly tell you if they're adapted to finishing with Abbott barrels and materials.

The Abbott Ball Company
 1046 New Britain Ave. Hartford, Conn.

Strip Copper Plate

the Streamlined Way with

McKeon's
"Liquid Sulphur"
TRADE MARK REGD.

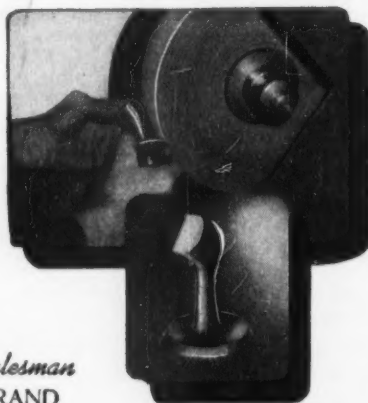
Safe for All Base Metals

Write for Literature and Advice.

SULPHUR PRODUCTS CO. Greensburg, Pa.

FELT DOES IT BETTER

What a difference in your finished product when you use *Paramount Felt Polishing Wheels* for grease polishing—that all-important finish that swings the buyer's decision to your product.



Ask your supplies salesman
 for **PARAMOUNT BRAND**

Bacon Felt Co.

WINCHESTER, MASS. ESTABLISHED SINCE 1824

Business Items

During 1943, with the large plant's manufacturing facilities geared to produce war materials at full capacity, the management and personnel of *The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.*, Passaic, N. J., will observe the Division's fiftieth anniversary of its founding as *The Manhattan Rubber Mfg. Company*.

The original company was incorporated on October 28, 1893 during the panic which lasted from 1893 to 1897. The fact that the founders entrusted their investments to the management during those days of uncertainty indicated the faith they had in the men who managed and built up the enterprise.

The incorporators were *Frank Cazenove Jones*, father of Mr. Jones, president of *The Okonite Co.*, *W. W. Dashiell*, last surviving founder, *Arthur Farragut Townsend*, *Peter Reid* of *Reid & Barry*, *Samuel J. Watson*, of the *Watson Machine Company*, Paterson, and *George Woffenden*. At the first meeting of the incorporators on November 1, 1893, Mr. Watson, Mr. Woffenden, Mr. Dashiell, Mr. Jones and Colonel Townsend were elected to the board of directors. Officers of the company elected at the same meeting were: Mr. Jones, president, and Colonel Townsend, secretary and treasurer. At another meeting within the same year, Colonel Townsend became vice-president and assistant general manager; *Thomas Robins, Jr.*, secretary and the late *Commodore Alexander Henderson*, U.S.N., retired, treasurer.

Mr. Jones, the first president, was forced to retire in 1903 because of ill health, and was succeeded by the late Colonel Townsend, who served as president for 26 years up to the merger in 1929 which formed *Raybestos-Manhattan, Inc.*

From 1929 until his death on January 14, 1940, Colonel Townsend was chairman of the board of *Raybestos-Manhattan, Inc.*, and general manager of the *Manhattan Division*. Colonel Townsend was highly instrumental in building up the company, giving it most of his attention. He was a godson of Admiral Farragut and cousin of Henry Fowl Durant, Boston lawyer and founder of *Wellesley College*.

Two of *Manhattan's* early executives and several employees have been with the company for more than 45 years. These officials are *F. L. Curtis*, now vice-president and treasurer of *Raybestos-Manhattan, Inc.* who was manager of the company's original factory office, and *C. T. Young*, factory manager, who was assistant to Mr. Curtis in the early factory office. Another early employee is *C. E. Cummings*, at present assistant secretary.

Manhattan, with a plant in *Passaic* that now employs nearly 4,000 persons and covers more than a million square feet of floor space, is now entirely engaged in war work. To date, 920 of its men have entered the armed forces.

As of February 1st, Industrial Sheet Metal Works, Inc., manufacturers of spray booths, will be known as the *Industrial Equipment Corporation*.

The broadened scope of the company's activities made the directors feel that its new name more adequately describes the company and its purposes.

The same management will continue in office and the company's address remains 628 East Forest Ave., Detroit, Mich.

The *Mitchell-Bradford Chemical Co.*, Bridgeport, Conn., has announced that *Protective Coatings, Inc.*, headed by H. Tom Collord of Detroit, has contracted to represent them in Michigan, the far West and in certain other parts of the country.

Roger W. Allen, district sales engineer for *Foxboro Co.* at Atlanta, Ga., for the past six years, has been named southeastern district manager for *Wheelco Instruments Co.*, Chicago. He will make his headquarters at 305 Techwood Dr., Atlanta.

A native of Atlanta, Mr. Allen attended Massachusetts Institute of Technology and holds an electrical engineering degree from Georgia Technological Institute. He is licensed as a professional engineer by the state of Georgia. While with *Foxboro*, he specialized in pyrometric instruments. Earlier he was with *Johns-Manville Sales Corp.*

Advance Polishing Wheels, Inc., 844 W. 49th Place, Chicago, Ill., manufacturers of buffs and polishing wheels, have announced the following changes in officers: W. L. Whitson is the new president; H. S. Keshaw, the vice-president, George O'Connell, the secretary and W. D. Briggs, the treasurer. James J. Manderscheid is no longer connected with the company.

A special award of honor "for distinguished service to safety" was presented on January 5 to E. I. du Pont de Nemours and Co. by the National Safety Council.

The award was announced by Colonel John Stilwell, president of the Council, and head of a nation-wide campaign conducted at the request of President Roosevelt, to "save manpower for warpower." It was accepted by Walter S. Carpenter, Jr., president of the Du Pont Company. The ceremony took place on the Cavalcade of America radio program.

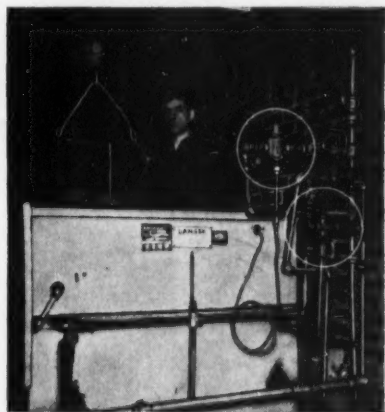
A third unit of the *National Carbon Co.* will be established in Winston-Salem, N. C., with the approval of the Navy Department. The old finishing plant of the Chatham Mfg. Co., with about 75,000 square feet of space, will be leased. The new plant in Winston-Salem will make an undisclosed product for the navy, and will employ about 1200 persons in two shifts of 600 each. Many of those employed will be women, it was announced.

Development of a process of chromeplating and re boring cylinders on a war product being produced by the *Westinghouse Electric and Manufacturing Co.*, East Springfield, Mass. plant, reclaimed 203 cylinders and saved 1400 pounds of critical material and more than \$1,000 in a three-month period.

The requirements of accuracy in size and smoothness of finish of the bore in these cylinders formerly resulted in a considerable scrap loss. Alec Ross, quality control foreman, saw the opportunity and proposed the improvement and Colin Hastie, plating room foreman, developed the process being used with its consequent saving in time and material.

The *Stanley Chemical Co.* of East Berlin, Conn., announces the addition to its technical staff of Dr. A. J. Cofrancesco who will devote his efforts to the field of synthetic chemistry and the development of rubber-like materials.

Dr. Cofrancesco was graduated from Wesleyan in 1933 receiving his B.A. with distinction in chemistry. He received his M.A. in 1934. During 1934 and 1935 he was with the Guggenheim Corp. of New York and the following two years were spent in the laboratory of The Stanley Chemical Co. In 1939, he received his doctor's degree from the Yale Graduate School of Chemistry and for the past three years was with the Calco Chemical Co.



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On the 23rd anniversary of the founding of *Detroit Rex Products Co.*, the annual meetings of the stockholders and board of directors were held. At the latter meeting, *Ellsworth W. Allison* was elected assistant secretary of the company.

Mr. Allison received his primary schooling through Junior College in Bay City, Michigan. He attended the University of Michigan and was secretary of the 1935 Law Class the year of his graduation. He holds degrees of AB and JD from the Literary and Law Schools respectively.

Previous to joining *Detroit Rex Products Company*, Mr. Allison was associated for six years with the law firm of Lucking, Van Auken and Sprague in Detroit. He is president of the University of Michigan Club of Detroit, and is a member of the Detroit Boat Club.

W. W. Davidson, vice-president and general sales manager of *Detroit Rex Products Co.*, manufacturers of Detrex solvent degreasers and metal washing equipment, recently announced establishment of two new offices. The North Central Region, which includes the entire state of Michigan except the upper peninsula, has headquarters in Detroit. *R. W. Pflug*, who is in charge, also supervises the handling of large national accounts whose home offices, including purchasing and control, are in Detroit.

W. F. Newbery is manager of the South Central Region which comprises the states of Ohio, Indiana and Kentucky. Offices for

this territory were recently established in the Mutual Home Building, Dayton, Ohio.

At Ontario, California, on January 11, the Army-Navy "E" award was presented to the *General Electric Company's Ontario Works*, which formerly made electric appliances. The "E" flag was unfurled beside the service banner, and the U. S. Treasury "T" flag, awarded for bond purchases. Three thousand persons, including factory workers, townspeople, officials of the armed services, and other dignitaries, attended.

Colonel Stephen J. Idzorek, U. S. Army Air Force, presented the award, the significance of which was explained by *Lieut. John L. Volz*, U. S. Navy. *W. H. Tangeman*, manager of the Ontario Works and *Andrew Conahan*, president of Local No. 1912, United Electrical Radio and Machine Workers of America, gave acceptance talks.

A. C. Sanger, of General Electric Company's Appliance & Merchandise Department headquarters, Bridgeport, Conn., accepted a token bestowal of "E" pins. Mr. Sanger, manager of G. E.'s heating device, clock, fan and sunlamp sections, is supervising war production of these now-converted appliance sections.

John M. Davies, in the research division of *The B. F. Goodrich Co.* since 1926, has been named director of physical research, it was announced by *Dr. H. E. Fritz*, company research director.

A resident of Summit county all his life, Davies is a graduate of Central high school and the University of Akron where he re-

ceived his science degrees. He also did graduate work at the University of Chicago.

Henry T. Riddick, with *The Osborn Manufacturing Company*, 5401 Hamilton Ave., Cleveland, O., for the last 32 years, has been named sales service manager of the company's brush division.

He will continue to serve as credit manager, which office he has held for many years. In his new duties he replaces *L. J. Bechhold*, who recently resigned.

Roy O. McIntire has joined the research staff of Battelle Memorial Institute, Columbus, Ohio, where he will be engaged in metallurgical research and development.

A graduate of Manchester College, North Manchester, Indiana, Mr. McIntire holds a Bachelor of Arts degree in chemistry and has had post-graduate work in industrial metallurgical processes at Purdue University. He was associated with the Carnegie-Illinois Steel Corporation in its Gary (Indiana) Sheet and Tin Mills before coming to Battelle.

Chester Malysiak, chemical engineering graduate of Purdue University, has been appointed to the research staff of Battelle Memorial Institute, Columbus, Ohio, where he will assist in the conducting of research in the division of non-ferrous metallurgy.

Mr. Malysiak has held chemical and metallurgical positions with the Bingham Stamping Company, the Owens-Illinois Glass Company, and the Continental Steel Company.

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Personals



Louis V. Hague, vice-president of Hanson-Van Winkle-Munning Co., Matawan, N. J. was elected Mayor of Rumson, N. J.

Bob Sizelove, technical director of Frederic Gumm Chemical Co., Inc., 538 Forest St., Kearny, N. J. is recuperating from a broken hip suffered while he and his brother Oliver and their wives were sleigh riding at Buck Hill Falls over the New Year's week end.

Obituary

Philip Palumbo

Philip Palumbo, 46, a plater at the Keystone Chromium Corporation, Buffalo, N. Y., died of a heart attack on Friday, February 12th.

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Supply Prices, March 1, 1943

Anodes

Prices are f.o.b. shipping point on quantities of from 500-999 lbs. for copper, brass and zinc. For nickel, prices are for quantities from 500-2,999 lbs.

COPPER: Cast, elliptical, 15" and longer	25½c. per lb.	ZINC: Cast, 99.99, 16" and over	16¼c. per lb.
Electrolytic, full size, 22½c; cut to size	22½c. per lb.	NICKEL: 95-97 cast, elliptical 46c. per lb., 99% plus	
Rolled, oval, straight 15" and longer 23¼c.		cast 47c.; rolled, depolarized	49c. per lb.
per lb.; curved	24¼c. per lb.	SILVER: Rolled, .999 fine per Troy (1-9) oz.	58c. per oz.
BRASS: Cast, 80-20, elliptical, 15" and longer	23½c. per lb.		

Chemicals

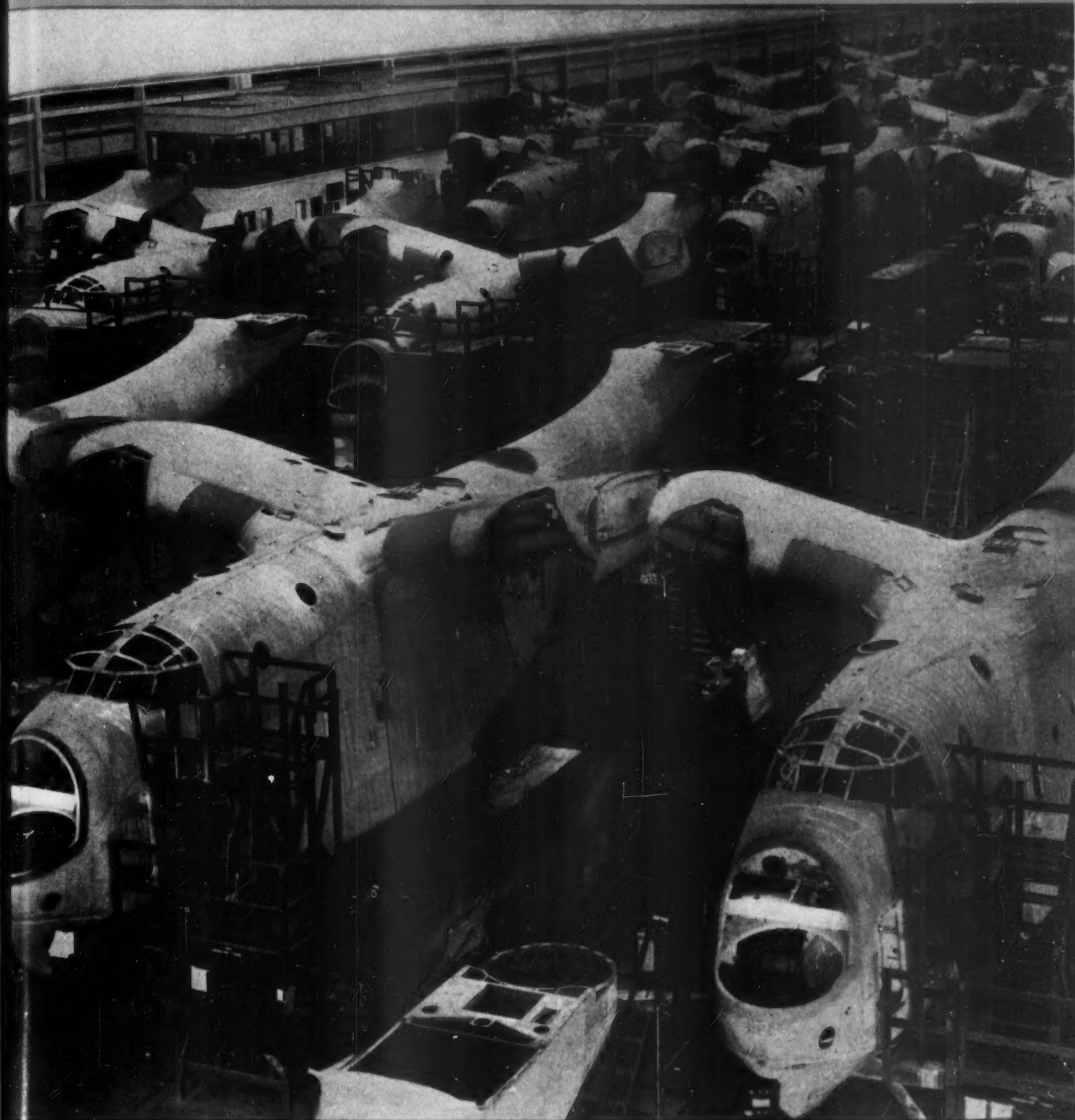
These are manufacturers' quantity prices and based on delivery from New York City.

Acetone, C.P., drums, l.c.l.	lb.	.09	Hydrogen Peroxide, 100 volume, carboys	lb.	.16-.185
Acid, Boric tech., 99.5% gran., bbls.	lb.	.0635	Iron Sulphate (Copperas), cryst., bbls., 1-4 wks.	lb.	.02
Chromic, 99%, 100 lb. drums, l.c.l.	lb.	.1725-.1825	Lead, Acetate (Sugar of Lead), crystals, bbls.	lb.	.125
Hydrochloric (muriatic) tech., 20°, carboys, wks.	lb.	.0175	Oxide (Litharge), com., powdered, bbls.	lb.	.09
Hydrochloric (muriatic) C.P., 22°, 6 lb. bottles	lb.	.19	Magnesium Sulphate (Epsom Salts), tech., bbls.	lb.	.019
Hydrofluoric, 30% bbls.	lb.	.06	Mercury Bichloride (Corrosive Sublimite), crys.	lb.	\$2.39
Nitric, 36°, carboys 1-9, wks.	lb.	.0595	Mercuric Oxide, tech., red, powder, bbls.	lb.	\$3.26
Nitric, 42°, carboys c.l., wks.	lb.	.065	Nickel, Carbonate, dry, bbls.	lb.	.36-.365
Oleic (Red Oil), distilled, drums	lb.	.1275-.1375	Chloride, bbls.	lb.	.18-.20
Oxalic, small quantities	lb.	.125	Salts, single, 425 lb. bbls.	lb.	.13-.135
Stearic, distilled, double pressed, bags	lb.	.145-.155	Salts, double, 425 lb. bbls.	lb.	.135-.145
single pressed, bags	lb.	.14-.15	Paraffin, refined, 123-125 A.M.P.	lb.	.052
triple pressed, bags	lb.	.175-.185	Perchlorethylene, drums, l.c.l.	lb.	.085
Sulphuric, 66°, carboys c.l., wks.	lb.	.015	Phosphorus, red, cases	lb.	.40-.44
Alcohol, Amyl (Fusel oil, ref'd), l.c.l., drums	lb.	.151	yellow, cases	lb.	.23-.25
Butyl-normal, l.c.l., drums	lb.	.1225-.1575	Potash, Caustic, 88-92%, flake, works, c.l.	lb.	.07
Denat., S.D. \$1, 190 pf., 1-18 drms., wks.	gal.	.615	Potassium, Bichromate, casks	lb.	.10
Diacetone, tech., drums, l.c.l.	lb.	.115-.14	Carbonate (potash) calc., wks., drums	lb.	.065
Methyl, (Methanol), 95%, drums, l.c.l.	gal.	.37	Cyanide, 94-96%, dom. dms., wks.	lb.	.55
Propyl-Iso, 99%, drums, l.c.l.	gal.	.47	Pumice, ground, 1½ F. & coarser, bbls., wks.	lb.	.045
Propyl-Normal, drums, wks.	gal.	.67-.70	Quicksilver (Mercury), dom. 76 lb. flasks, net	flask	\$191.
Alum, ammonia, granular, bbls., works	lb.	.04	Rochelle Salts, crystals, bbls.	lb.	.44
Potash, granular, bbls., works	lb.	.0425	Rosin, gum, D dms., dock	lb.	.0365
Ammonia, aqua, 26°, carboys	lb.	.0525	Silver, Chloride, dry, 50 oz. lots	oz.	.455
Ammonium, chloride (sal-ammoniac), white, granu- lar, bbls., wks.	lb.	.0515	Cyanide, 100 oz. lots	oz.	.41½
Sulphocyanide (thiocyanate), C.P., crystal, dms.	lb.	.45	Nitrate, 100 oz. lots	oz.	.32½
Sulphocyanide (thiocyanate) 95/98%, tech., dms.	lb.	.17	Sodium, Carb. (soda ash), light, 58%, bags, l.c.l.	lb.	.0213
Antimony Chloride (butter of antimony), sol., carboys	lb.	.17	Cyanide, 96%, dom. 100 lb. drums	lb.	.15
Barium Carbonate, pptd., bags, l.c.l., works	lb.	.03	Hydroxide (caustic soda) 76%, flake, l.c.l.	lb.	.0355-.049
Benzene (Benzol), 90%, drums, works	gal.	.20	Hypsulphite, crystals, bags, wks.	lb.	.0225
Butyl Lactate, drums	lb.	.265	Metasilicate, granular, 1-9 bbls.	lb.	.0355
Cadmium Oxide, l.c.l., bbls.	lb.	.95	Nitrate, rfd., gran., bbls., wks.	lb.	.04
Calcium Carbonate (Pp'd. chalk), c.l., wks.	lb.	.02	Phosphate, tribasic, l.c.l., bbls., wks.	lb.	.0365
Carbon Bisulphide, l.c.l., 55 gal. drums	lb.	.0575	Pyrophosphate, anhydrous, bags, c.l., wks.	lb.	.0528-.0610
Carbon Tetrachloride, l.c.l., 52½ gal. dms.	gal.	.80	Sesquisilicate, 1-9 bbls.	lb.	.043
Cobalt Sulphate, drums	lb.	.65	Stannate, drums	lb.	.335-.365
Copper, Acetate (verdigris), bbls.	lb.	.26-.35	Sulphate, anhydrous, bbls., works	lb.	.022-.024
Carbonate, 52-54%, bbls.	lb.	.195-.205	Sulphocyanide, drums	lb.	.55-.65
Cyanide, Tech., 100 lb. bbls.	lb.	.34-.38	Sulphur, Flowers, U.S.P., bbls., l.c.l. mine	lb.	.0415
Sulphate, 99%, crystals, bbls., 1-5	lb.	.0565	Tin Chloride, crystals, kgs	lb.	.39-.395
Cream of Tartar (potassium bitartrate), gran., kegs	lb.	.585	Toluene (Toluol), 2°, ind., drums	gal.	.33
Crocus Martis (iron oxide) red, bbls.	lb.	.09	Trichlorethylene, drums, l.c.l., zone 1	lb.	.085
Dextrin, white, bags, l.c.l., F.O.B. Chicago	lb.	.0415	Tripoli, air floated, bgs., c.l., wks.	ton	\$21.50
Dibutyl Phthalate, drums, l.c.l.	lb.	.205-.2120	Wax, Bees, yellow, crude	lb.	.4475
Diethylene Glycol, drums, l.c.l., works	lb.	.155	Carnauba, refined, bags	lb.	.7675-.80
Emery (Turkish)	lb.	.08	Montan, bags	lb.	.45-.46
Ethyl Acetate, 85%, l.c.l., drums, works	lb.	.1220-.125	Spermaceti, blocks	lb.	.26-.27
Ethylene Glycol, l.c.l., drums, works	lb.	.165	Whiting, chalk, l.c.l.	ton	\$20-\$24
Monoethyl ether, dms., l.c.l., wks.	lb.	.155-.165	Xylene (Xylol), ind., returnable drums, works	gal.	.32
Gold, Chloride, yellow, 4 oz. bottles	oz.	\$19.00	Zinc, carbonate, tech., bbls.	lb.	.14-.20
Cyanide, potassium 41%, bottles, wks.	oz.	\$14.20-\$14.95	Cyanide, 100 lb. kegs	lb.	.33-.37
Gum. Arabic, white, powder, bbls.	lb.	.33-.35	Chloride, tech., granular, drums, c.l., wks.	lb.	.0575
			Sulphate, crystals, bbls., l.c.l.	lb.	.046

MARCH, 1943

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MARCH, 1943

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Domestic Drying Oils

Chinawood or tung oil is one of the best of the drying oils. Because of its excellent water resistance, durability and speed of drying, it is an important ingredient in the formulation of many finishing materials. It was, then, with considerable misgiving that the finishing industry viewed the decreasing exports of this oil from China as a result of Japan's undeclared war on that country. However, as imported tung oil became more difficult to obtain, research into drying oils was intensified.

This research took two directions. First, study of the problem of growing tung nut trees in the United States was accelerated. Second, much work was undertaken to determine if domestic oils, such as linseed oil, etc., could be processed to reproduce some or all of the desirable properties of tung oil.

Much has been accomplished in both fields. Tung nut groves planted in the southern states are actually producing. Processes have been developed for treating castor oil and, more recently, linseed oil to produce fine drying oils.

As we know, tung oil from China is no longer available. That does not mean, however, that the finishing industry can not continue making materials for all war needs which require drying oils. We have some imported tung oil on hand. The domestically produced tung oil is coming along in larger quantities. And the new treated oils offer excellent substitutes for tung oil. It might have been different if, until we had declared war, tung oil from China had been available in large quantities. As it is, we are now practically independent of outside sources. When the war is over we will be in a position to buy oils or not, as we see fit, from outside the United States. In short, we will be independent of the world for another raw material.



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Conclusion

By FRANK V. FAULHABER

AS the anodized parts in the Glenn L. Martin Company plant are taken from the baskets on the overhead chain conveyor, the pieces are started on their journey through the robot sprayer. Placed on the cross-bars of the endless belt, they are first carried under a set of over-head spray guns which whip back and forth across the moving pieces. As the belt moves on, the parts are conveyed through an oven equipped with infra-red lamps designed to speed the drying process, and then through a second drying unit where numerous fans force warm air on the parts.

These infra-red lamps are so arranged that they may be turned on in units of four or more, depending upon the type of paint being applied. When the paint dries rapidly of its own accord, it is not necessary to use the lamps at all. When the paint is a slow drier, the lamps are turned on. This infra-red oven also makes it possible to increase the speed of the machine whenever necessary.

After having passed through the ovens, the parts, now completely dry and painted on one side, are taken from the conveyor, turned over and placed on the other conveyor which travels in the opposite direction. When the pieces have reached the end, they are completely covered with a primary coat of anti-acid paint, which is designed to eliminate, as far as possible, the action of corrosive elements on the metal.

From the time the parts are started on their way through the machine until they have been removed and sent on to the finished parts stock or to the assembly line in the Martin plant, about fifteen minutes have elapsed.

Infra-Red Drying

Infra-red heating is especially appropriate for the finishing of airplane parts. The work is dried by the aid of carbon filament lamps which are available in 250-watt, 500-watt, and 1000-watt sizes. A paramount factor

The author concludes his discussion of warplane finishing. Infra-red baking at the Glenn L. Martin Company of Baltimore is described and a general discussion of this method of baking is given. —Ed.

is the concentration of the radiation falling on the work. This is determined by the wattage of the drying lamps (which resemble incandescent bulbs), the design and efficiency of the reflectors, and the distance from the lamps to the work. The intensity of the radiant energy is measured with a thermopile, which is calibrated to read in terms of watts per square inch.

The energy absorbed by the work depends to a great extent on the reflection power of the painted surface; in other words, whether it is light or dark, red or green, smooth or rough. All other factors being equal, black and other dark paints will bake faster than whites and light colors. The ele-

ment of reflection on a painted film is not necessarily identical for infra-red radiation and for visible light, some paints absorbing considerably more in the infra-red than in the visible part of the spectrum.

Some indication of the near infra-red reflection of paints can be obtained by photographic methods, since specially sensitized film is now available which is sensitive up to about 9000 angstrom units. Such a procedure signifies that the near infra-red reflection or absorption of ordinary paint pigments is like the reflection or absorption potency of visible red light.

Significant Factors

Other significant factors are the specific heat, the conductivity, and the heat loss from the work. The latter consideration embraces low temperature radiation by the work, conduction

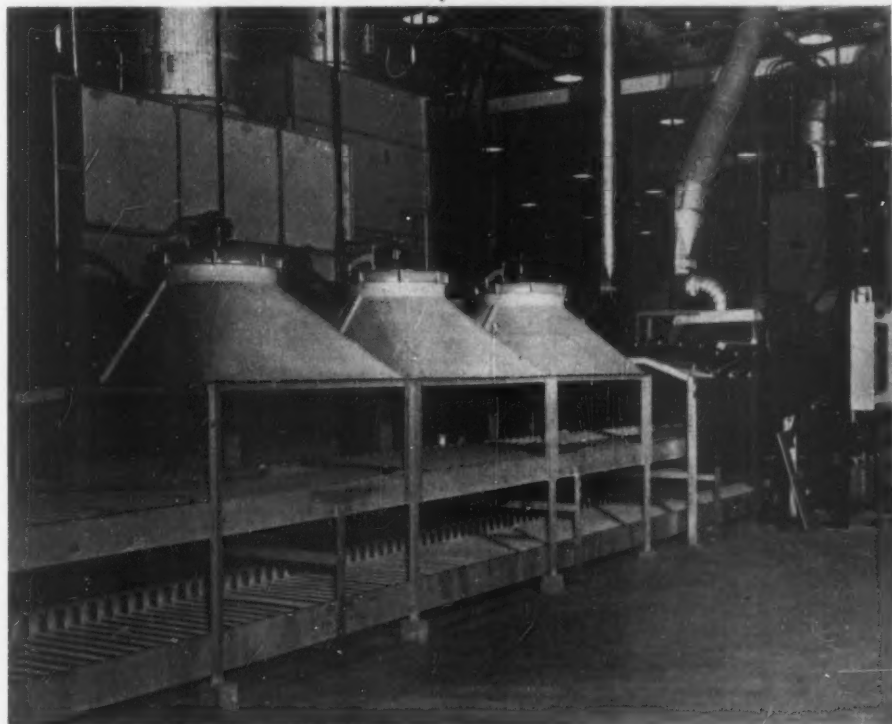


Fig. 1—After passing under the sprayer and through the ventilator unit, the freshly painted parts move through the infra-red oven and fan dryer unit. After the parts have passed the drying units, they are on the second phase of their journey.

to backing and supporting members, convection currents, drafts, etc. Drafts can chill the work appreciably, thus decreasing the efficiency of the process, and it is, therefore, desirable to reduce this loss to a minimum. A certain amount of ventilation or air movement is required to keep the concentration of volatile, flammable material below a safe minimum value. In some cases the natural ventilation caused by air currents heated by the hot work is adequate to remove the solvent vapors; in other instances, draft shields and exhaust hoods may be required. With the correct technique in use, there need be no fear of explosions.

At one time, it was not possible to bake the so-called high-bake synthetic enamels satisfactorily. With higher concentrations of energy now available, it should be possible to bake almost any kind of synthetic enamel. Oil paints and oleoresinous enamels require considerable oxidation to effect satisfactory curing and consequently cannot be baked so rapidly under the lamps. For most purposes, the finishes best adaptable for use with present drying lamps are the synthetic enamels, lacquers, and synthetic lacquers.

Because of the lower heat absorption of white and light colored enamels, it is difficult to bake these as rapidly as desired without modification of the vehicle. It is feasible, however, to bake such materials by heating the reverse side of the metal and thus utilize the higher absorption factor of the bare steel, provided the work is of such character that irradiation of the reverse side is possible and practical. Whenever the metal receives different coatings on the two sides, the radiant energy should be directed to the side with the highest absorption factor if possible.

Aluminum Reflection

Aluminum, which is used to such a vast extent in the airplane industry, reflects more infra-red rays than polished steel; hence, it requires a longer drying time to bake finishes on it than on polished steel. Unpolished steel, on the other hand, will reflect fewer rays than polished steel and, as a metal, is considered more appropriate for bake-finishing by the infra-red method.

Thin metal sheets are more suitable for the baking of finishes by infra-red

than heavier metal parts. With heavier types of work, the heat is conducted away from the surface through the body of the metal, with the result that the finish does not reach baking temperatures as rapidly as it does on thinner work.

When the finishing department contemplates installation of an infra-red heating unit, various factors are important. For example, the major portion of the solvent in a paint film will evaporate spontaneously in a few moments, so there is little to be achieved by applying the radiation while this solvent is evaporating. At the other end of the operation, it is possible to avoid forced cooling of the work by having the conveyor pass beyond the lamps, permitting the finish to continue baking with the heat energy stored in the metal and reducing the number of lamps required.

Inasmuch as only that part of the energy which is intercepted and absorbed can be useful in raising the temperature of the work, it stands to reason that those objects which present a relatively large area to the lamps, in proportion to their mass, are most suitable for this type of finishing. Since the air in a radiant drying unit is not heated appreciably, it is desirable that the conveyor for transporting the work be so arranged that each piece under process receives the energy directly upon as large a part of the total area as possible. However, parts such as flanges, etc., often will receive enough heat by conduction to bake them.

Experimental Unit

Of vital concern to the prospective user of infra-red baking is the type of experimental unit required to perform the necessary ground work. Such experimentation, of course, is advisable on a small section, thence computing the requirements for the entire installation. In an experimental unit it is desirable to duplicate closely the concentration of energy which will be used in the final installation. It is necessary that the infra-red bank be large enough to cover the sample. When the work is flat and small, or when a small section of a flat article can be taken, the minimum experimental bank may well consist of seven units—six mounted in the form of a hexagon with the seventh in the center. With such an arrangement, the work under the center unit will re-

ceive approximately the identical concentration of energy as will be obtained from a large, flat bank of such units mounted on the same centers. With such a bank, the samples should not be much larger than the area of the central unit. The ideal experimental unit would be a section of the proposed tunnel or bank long enough to surround one of the objects being baked.

Within certain limits, the distance from the reflectors to the work is not too critical when the units are mounted in large banks or tunnels. Ordinarily, however, the closer the reflectors are to the work, the higher the intensity directly under the lamps, but the more spotty the resulting distribution of energy. Average intensity, however, is only slightly altered by close mounting beyond a given distance. In practice, mounting distances of 5 to 18 inches are usually used, but this applies only to large banks. On most metals, conduction will distribute the heat to a considerable extent; nevertheless, the radiated energy should be directed fairly uniformly over the entire area of the product to be finished. The use of one or two lamps for preparatory testing, seldom yields definite information, and usually the performance of larger installations are more satisfactory.

Controlling Factor

Originally it was thought that the reduced baking time possible with infra-red lamps was due to some catalytic or accelerating effect exerted by the radiation. To the contrary, extensive tests on a variety of work indicate that the temperature attained by the work is the controlling factor and that the results obtained are actually due to the higher temperatures reached in a short time. The simplest and most decisive of such tests consists of painting both sides of a metal panel and subjecting one side only to the radiation. When the panel is comparatively thin, say, of 22 gauge, so that the heat conducts through it readily, no apparent difference in the results on the two sides will be observed.

Since any hot substance emits infra-red radiation, the hotter this substance the shorter will be the peak wavelength of the radiation. Ordinary ovens at 250-350° F. emit radiant energy of a fairly long wave-length, peaking at about 50,000 angstrom units, but only a small portion of the energy

in such an oven is in radiant form. One type of baking oven provides infra-red radiation with the major portion of the energy involved below a wave length of 20,000 angstrom units. To furnish this wave-length radiation with an incandescent body, the body must have a temperature of 6,000° K. or higher. The sun, with a temperature of 6,000° K., is the best known source of energy of the shorter wave-lengths. The filaments of ordinary lamps have temperatures ranging from 2,600 to 3,200° K. Carbon lamps operate at a lower temperature, of the order of 2,000° K.

Calrod Units

Calrod resistance heater units operate between 1,200 and 1,500° K. However, the calrod units, not being enclosed in a bulb, are cooled by the surrounding air and for this reason are less efficient producers of radiant energy. The higher color temperatures and efficiencies obtained with incandescent lamps point to their general use for most infra-red baking installations.

The cost of an infra-red unit is naturally dependent on the rates per kilowatt-hour, which should be low to compare favorably with other means of heating. Even where the cost is somewhat higher, the advantages offered by radiant heating frequently make infra-red thermal operation preferable.

In considering the expense factor, it must be borne in mind that with an infra-red drying unit, its superior features actually decrease the final costs. The initial cost of installation itself is nominal, no doors, insulating walls or automatic temperature regulation being necessary. Less floor space is required for the drying equipment. Sometimes as little as one-tenth of the space entailed for other ovens is sufficient. As with other mediums of industrial heating, it is desirable to abide by any existing regulations regarding fire safety and to meet insurance requirements.

Other advantages of the infra-red system, besides expediting finishing operations and its particular adaptability to mass production, are that more time is saved and more flexibility of operation is possible. It is conceded, also, that there is less fire hazard than with other means of heating. The lamps of course, must be kept in good operating condition, must be properly

adjusted, and must be chosen for their peculiar adaptability.

Special Paints

For every method of finishing and every method of heating or drying, individual paints are prescribed. This is true also of infra-red finishing and for that reason paint manufacturers will help the individual plant to select the proper finishes that are not only suitable for the ultimate finishing results sought, but also represent the utmost in workability.

With respect to lamp upkeep, the finishing department does well when the entire equipment is maintained in clean operating condition. Lamps and reflectors should be cleaned about once a month. Accumulated paint materials impair the efficiency of the reflectors, and in the course of operations this equipment may become begrimed. With a soft cloth a mixture of a suitable thinner and lamp black can be applied on the reflectors, rubbing from the center to the edge. This will remove paint film and all particles and will improve reflectivity. Since it is desirable not to mar the highly polished surfaces of the reflectors, it is inadvisable to use abrasive cleaners or other harsh compounds that may cause scratches. Care should be exercised

not to break any of the lamps, especially if any fumes are present. Sometimes caustic soda solutions are used for cleaning reflectors but such extra handling may not always be advisable, because of the added time involved and the possibility of lamp breakage.

Usually, equipment manufacturers will supply instructions for the proper cleaning and maintenance of their lamps and reflectors. In some cases a simple wiping of the cover glass will suffice. Reflectors usually retain their efficiency for from three to five years before replating is in order.

No Warm-Up Necessary

Another important feature of infra-red heating is that no warm-up period is required. Unlike the lengthy baking schedules required with a convection oven, considerable work is being processed in ten minutes or less and the radiant heating can be started almost instantly.

From the standpoint of the employees, the comfort factor must not be overlooked. With radiant heating there is practically no discomfort experienced by those working in the vicinity, which cannot be said for some of the old-time ovens which left the workers limp and weary and gasping for more air.

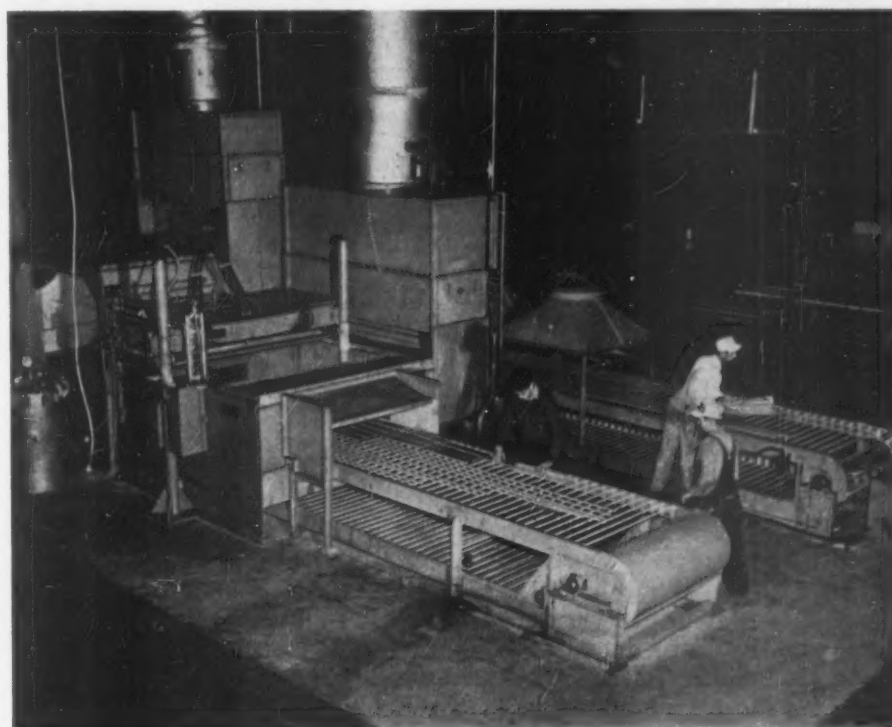


Fig. 2—Parts, painted on one side, are started on a duplicate of their first trip down the line. When they reach the end of the second phase in the robot spraying process, they will be completely covered with a protective coat of corrosion-resistant paint.

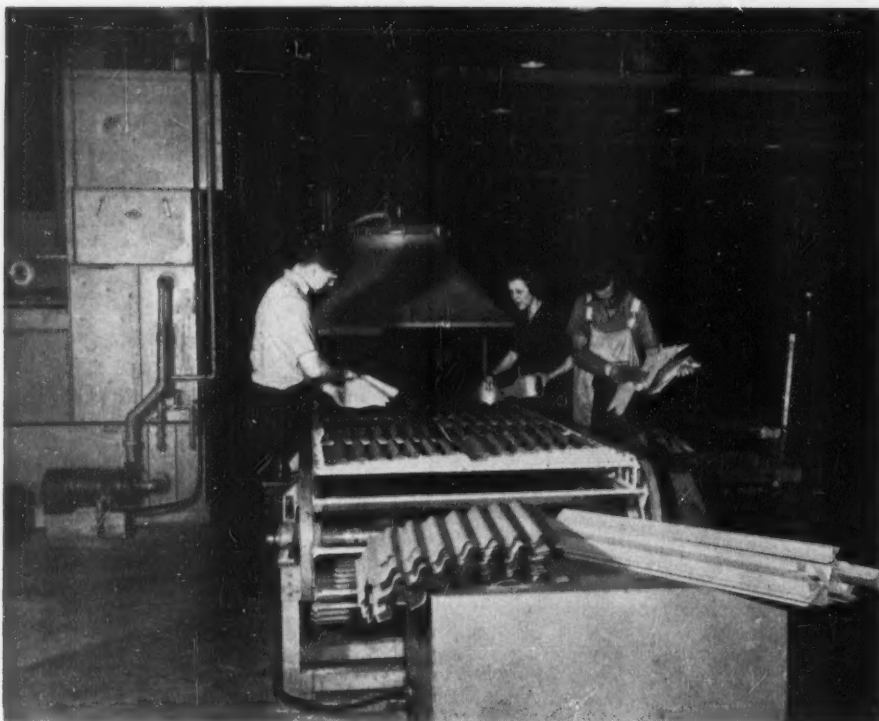


Fig. 3—At the end of their journey through the robot paint sprayer, parts are completely covered with a protective coat of paint. Here they are being removed from the endless belt and placed in bins, ready to move on to the production line. Parts of all shapes and sizes undergo the robot paint spraying treatment.

In addition to faster finishing, the work is of superior quality when infra-red drying is used. Since there is nothing intricate or involved with infra-red heating, once the equipment is understood, correctly maintained and operated, the product as a rule is of uniformly high quality, with negligible spoilage. First bakes, when the tunnel is placed in operation, measure up as satisfactorily as those issuing later in the plant's schedule.

Along with the saving of time and other economies, there is also another saving of fuel or current effected, since the equipment can be turned on or off at short notice.

Anent Alterations

Naturally, though a radiant heating unit can be readily disassembled and altered to accommodate a different line of articles, such alterations are somewhat expensive and involve delay. Such alterations should not be undertaken without expert supervision. Whenever a radiant heating unit is set up, the matter of minimizing energy losses must be borne in mind. A change to a different type of lamp or a different arrangement may be in order. With correct installation, of course, radiant heating can process a variety of sizes and shapes of products. It is merely a matter of plan-

ning to accommodate the exact article.

A radiant heating unit is constructed with the whole electrical system exterior to the oven. The wires are enclosed in special channels to a central control panel. Effective control of the entire arrangement is afforded by interlocking devices. For example, the conveyors, the ventilating unit, the spraying apparatus and the heating are so interlocked that any trouble occurring at any part of the operations will automatically halt the work, thereby preventing possible spoilage and insuring greater safety.

Especially in these days of frantic rush-work when the need for economizing on machinery and equipment is urgent, a radiant heating unit has timely potentialities. The finishing plant management may desire to utilize present convection ovens. A radiant convection oven is particularly suited for this purpose, inasmuch as it can be constructed to supplement or complement a plant's existing heating equipment. By reason of their comparatively light construction and easy maneuvering, infra-red convection ovens can be suspended from the ceiling, when feasible.

Other Potentialities

Another point in favor of radiant

heating is that this means of thermal application is also fitted to processing finishes by dipping, roller-coating, or flow-coating. Naturally the conveyor equipment should be properly attuned to the particular type of finishing under process. If everything is not properly co-ordinated even though there may be no special defect in lamp arrangement the work is liable to be overbaked or underbaked or some parts of it more so than others.

For that reason, a conveying system should be carefully designed for its intended job. Initially, the layout should be exact, planned so as to utilize to the utmost available space. The flights or carriers of the conveyor should be capable of efficient loading, spraying or dipping, cooling and removal of the finished product at the proper terminus. The character of parts handled, heat distribution and temperature control are matters for consideration. Essentially, a conveying system should preclude possibilities of interruptions or let-ups occasioned through failure of any part. Such discontinuity in operations results not only in retardation of output, but also wreaks serious havoc with the work under process.

Conveyor Construction

The construction of an efficient conveyor system for the handling of radiant heated work, should provide for the convenient placement of parts on the conveyor; for the application of spray paint or other means of finishing; for drip or solvent evaporation—to minimize spoilage and other hazards; for appropriate baking or drying; for cooling, and, finally, for the facile removal of the finished work. Thus, the conveying unit, which itself expedites a plant's finishing production, should be so constructed with the radiant heating system expressly in mind.

In the preparation of this article the writer is thankful for the co-operation of:

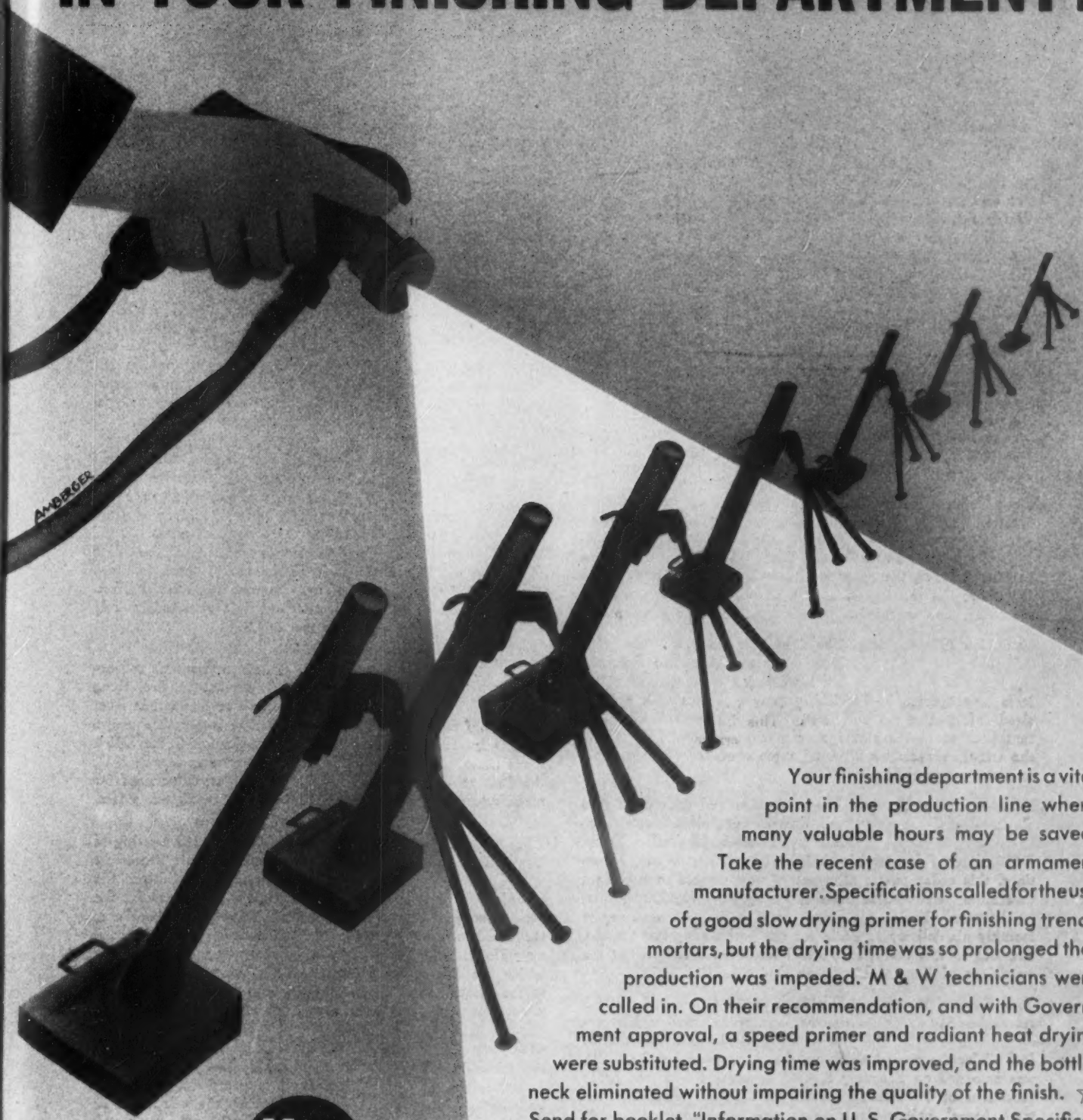
Mr. Terry E. Stephenson, Jr., of *Glenn L. Martin Co.*, Baltimore, Md.

Mr. B. C. Gardner, of *The DeVilbiss Co.*, Toledo, Ohio.

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THIS IS WASHINGTON—

By George W. Grupp

METAL FINISHING's Washington Correspondent

Business Men's Aids

The Business Service of the WPB Administrative Division reports that it now has "competently trained specialists" who can answer the questions of businessmen who are seeking solutions to their production problems. The Industry Advisory Service Unit and the Telephone Inquiry Unit of this branch are located in Room 1501 of the Social Security Building on Independence Ave., between Third and Fourth Sts., Washington, D. C. Separate liaison services are maintained in Room 304A in the old House Office Building, in Room 10-B in the Senate Office Building, and in the Information Center Building located at 14000 Pennsylvania Ave., Washington, D. C.

Capryl Alcohol Allocation Forms

Standard forms PD-600 and PD-601 must now be used in requesting allocations for capryl alcohol which is used in the manufacturing of coating materials. This change was requested in Allocation Order M-167, as amended February 6, 1943.

Conveyor Machinery Restrictions Removed

To remove the cause for delay in obtaining some essential machinery and to solve some production problems which arose under General Limitation Order L-193 issued in October 1942, the order was amended on January 21, 1943 to remove the restrictions on the purchase of used conveying machinery and mechanical power transmission equipment.

End Use Information Wanted

The Chemicals Division of the WPB in a statement issued on February 22, 1943, urged consumers of chemicals to cooperate by furnishing their suppliers with the desired information on end uses. This information is important because of the shortage of many critical chemicals and the war-time necessity of using these chemicals for the most essential purposes.

Fans and Blowers Controlled

The production and delivery of fans and blowers were placed under control by General Limitation Order L-280, dated February 16, 1943. With certain definite exceptions, this order affects all types of new devices or machines that move, compress or exhaust air by centrifugal, rotary or axial means. Under this order, the manufacturer must report monthly his delivery schedule for the forthcoming two months. Previous to this order, fans and blowers were covered by the provisions of General Limitation Order L-123.

Fuel Oil Amendment

Petroleum Distribution Order No. 3 issued January 18, 1943 which provided for a 40 per cent reduction of fuel oil for the current three months, upon advice of the WPB, was amended on February 5, 1943 to exempt from the order producers of 36 different chemicals such as ammonium nitrate, benzol, chlor-sulfonic acid, ethyl alcohol, phenol, phenolic resins, polyvinyl resins, sodium acetate, toluol, varnish cambric, vinyl acetate, and zinc chromite.

Glycerine Stock-Piles Shrinking

Glycerine which, among other things, is used as a protective coating for weapons, is needed by the nation. "The United States is being forced to use up its stocks of glycerine, an important war material, even though the means to balance production and consumption are within reach," the Office of War Information reported.

Naval Stores Containers

The Containers Division of the WPB on February 4, 1943 urged all naval stores producers of such commodities as rosin and turpentine to make immediate arrangements to obtain their 1943 requirements for containers other than steel drums. Because of the 30 per cent reduction in the use of steel drums in 1943 the industry will have to use a large number of wood barrels, paper bags, fiber drums, and tank cars.

New Critical List Released

Zinc, chromium, methyl methacrylate, benzol and derivatives, and methyl alcohol, are among the materials that have become more critical in supply since November 2, 1942. On February 1, 1943 the Conservation and Substitution Branch of the Conservation Division of the WPB issued a revised Materials Substitutions and Supply List.

New Paint Formulas Recommended

The National Bureau of Standards has prepared new formulas for the mixing of dry red lead, paste red lead, dry blue lead, paste blue lead, and three kinds of paste white lead for the purpose of saving 50 per cent of the normal linseed oil required. The Specifications Branch of the WPB Conservation Division recommends the use of these formulas since the saving of linseed oil will have no detrimental effect. The reduction of linseed oil content, it is reported, merely increases the pigment volume ratio.

Paint Pails and Prices

If paint manufacturers wish to continue shipping paint in five, three and two gallon steel pails, they must retain title to the pails. The obligation to retain title to the pails is imposed on manufacturers in Limitation Order L-197. Since these pails had no value to paint buyers in March 1942, the OPA ruled on February 20, 1943 that there is no need for manufacturers to reduce their March 1942 maximum prices.

Phenol Shortages Blamed

At the February 3, 1943 meeting of the Thermosetting Plastic Processors Industry Advisory Committee, the shortages of phenol and phenol materials were blamed for the production problems of the industry. To solve the problems, the members urged that the WPB Chemicals Division should expedite the building of new phenol producing facilities which are now under construction. It was also brought out at the meeting that progress was being made in substituting phenol for resins based on cresol and cresylic acid.

Phthalate Plasticizer Allocation Forms

Allocation Order M-203, as amended February 6, 1943, provides that henceforth standard forms PD-600 and PD-601 must be used in requesting the allocation of phthalate plasticizers which are used in making lacquers and enamels.

Steel Drum Restrictions

Beginning March 1, 1943, according to Limitation Order L-197 as amended January 29, 1943, no one is permitted to use steel drums as containers for such commodities as copper sulfate, amyl acetate, amyl alcohol, ethyl acetate, all grades of ethyl carbonate, ethyl oxalate, sodium chlorate and potassium chlorate.



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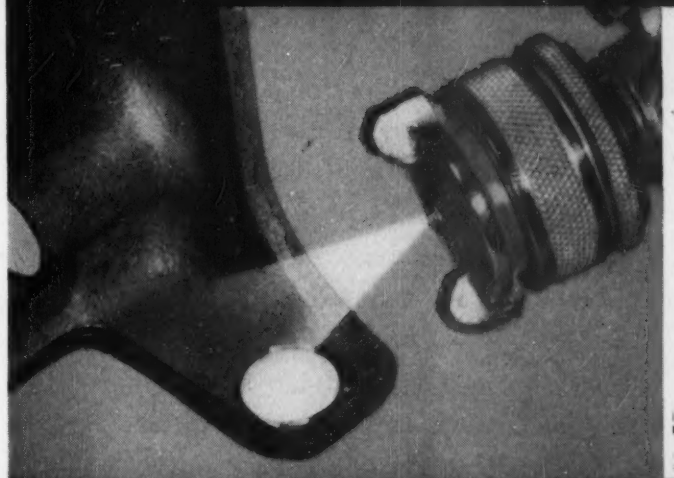
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Notes on Pigments

By STANLEY T. DINGMAN

SINCE the time when primitive man discovered that he could use brightly colored minerals and natural stains to decorate himself, his pottery and clothing, pigments have been playing an increasingly important part in the advancement of civilization as a component of protective coatings. Although first used only to impart color or opacity, pigments are now employed in lacquers, enamels and paints for many other reasons. The present demand for camouflaging is an example of the broadened field for pigmented materials.

Pigmented coatings also serve other practical purposes in modern industry and commerce. Different colored paints are used to identify factory air, steam, gas and water lines. White, and light colored finishes are applied to walls and ceilings of factories, homes, offices and stores to increase light reflectivity, thus reducing lighting costs and increasing production efficiency. Other instances of the value of pigmented finishes for purposes other than protection or decoration will suggest themselves.

Classification

Pigments may be classified in many ways according to their color, purpose, characteristics, etc. Perhaps the most convenient way to classify them is by chemical type. On this basis, they fall into two broad groups, namely, the inorganic pigments and the organic pigments.

In general, the inorganic pigments may be said to be those composed of inorganic compounds such as the oxides, hydroxides, sulfides, sulfates, etc. of such metals as iron, zinc, chromium

The author discusses the classification, manufacture and uses of pigments. The first of a series, this and subsequent articles should be of great interest and value to the users of finishing materials who desire some knowledge of the various ingredients of lacquers, enamels, paints, etc.—Ed.

lead, aluminum and cadmium. Actually, the inorganic pigments may be divided into three sub-classes. The first of these includes the natural inorganic pigments, many of which are named after the localities in which they are found. These are the ochres, siennas, umbers, Spanish oxides and similar pigments. Next come the synthetic inorganic pigments such as red lead, lithopone, iron oxides, white lead, ultramarine blue, chrome greens, etc. The final group comprises the elemental substances: aluminum metal, copper, zinc, and others.

Organic pigments include a much larger number of products than do the inorganic pigments. For convenience, they also may be subdivided into three classes: animal, vegetable and synthetic. The animal and vegetable organic pigments comprise natural coloring agents such as cochineal, carmine, Dutch pink, catechu, chlorophyll, Persian berries, and others.

Those organic pigments which have been classed as synthetic may be further subdivided into six groups. First of these is the basic type, the triphenyl methane derivatives and basic xanthenes. Following this come the insoluble and soluble azo compounds, pigments of the condensation acid type, the anthraquinone and vat type pigments. The final grouping is of miscellaneous pigments which do not

fall readily into any of the other groupings.

The following outline indicates how the pigments are grouped in accordance with the foregoing discussion:

Pigment Classification

A. Inorganic

1. Natural
2. Synthetic
3. Elemental

B. Organic

1. Animal
2. Vegetable
3. Synthetic
 - a. basic
 - b. insoluble azo
 - c. soluble azo
 - d. condensation acid
 - e. anthraquinone and vat
 - f. miscellaneous

To appraise or evaluate the pigments on the basis of the above classification would be both difficult and inaccurate. It may be said, however, that the animal and vegetable pigments are not as widely used as they formerly were because of their lack of color fastness and their variation of color.

Inorganic Pigments

Until a few years ago the inorganic pigments were the most important, both because of their abundance and because of the lack of knowledge about synthesizing organic pigments. However, where protection rather than decoration is of primary importance, the inorganic pigments are still widely used.

Generally speaking, the inorganic natural pigments are composed of iron

oxide in combination with calcium, magnesium and manganese compounds, alumina, silica and water.

They vary widely in color and often take their names from the localities where they occur. For instance, there are the Spanish oxides, French ochres, Persian Gulf oxides and Turkey umbers. They vary in hiding power and oil absorption and their colors may lack brilliance but they are likely to be more permanent than other types and therefore are widely used where outdoor resistance is a factor.

There is a growing tendency to produce these pigments synthetically and synthetic iron oxides made by precipitation, oxidation or decomposition of iron salts are becoming more popular. Synthetic iron oxides are of uniform particle size and are not excessively abrasive. Other advantages are greater dispersibility, tinting strength and hiding power. And although their unit cost may be higher, they can be used more economically than the natural earth pigments. On the other hand, synthetic iron oxides have a tendency to flood and bleed.

Other inorganic pigments are produced by a variety of chemical processes. Some of the most widely known colored pigments of this class are as follows:

Synthetic Inorganic Pigments

Blues

Ultramarine blue
Prussian blue
Chinese blue
Cobalt blue

Reds

Red lead
English vermilion
Iron oxides
Cadmium reds
Antimony sulfide

Yellows and Oranges

Lead chromates
Zinc chromates
Molybdate orange
Cobalt yellow
Cadmium sulfide

Greens

Paris green
Chrome greens



DESIGNING and installing spray painting equipment to do a specific job has been the business of the Binks Manufacturing Company for nearly half a century. The installation shown here was made recently by Binks in a mammoth new war plant. The giant three-deck water wash spray booths, spray painting equipment and accessories were designed by Binks engineers to keep finishing abreast of increased production . . . to provide healthful working conditions.

Binks wide peacetime experience in designing and installing tailor-made spray painting equipment has been of infinite value to companies in engineering the special equipment needed to speed up the finishing of planes, ships, bombs, shells, tanks, guns, torpedoes and other war equipment. The giant installation illustrated here and the hundreds of Binks installations in other war plants throughout the country, not only guarantee faster war production now . . . but point the way for better spray painting methods for all when peace comes.



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Although relatively few in number, the elemental pigments have become quite important. This group includes metallic aluminum, copper, zinc, various carbon pigments and some of the metallic alloys. They are particularly valuable because of their ability to withstand heat, fumes, weathering, etc.

Synthetic Organic Pigments

The pigments of the basic series are precipitated from the aqueous solutions of various dyes in the basic triphenylmethane group. Pigments produced in this way have great tinctorial power and brilliancy but are extremely fugitive in exposure to sun-

ARTMENTS

This three-tier rotary water wash tank is one of the largest in the world. It helps to speed the finishing of plant finishing machines.

A behind-the-scenes view showing the motors, starters, blowers and pumps needed to operate the giant water wash spray booth shown above.



T. LOUIS - MILWAUKEE - BOSTON - LOS ANGELES - SEATTLE - WINDSOR, ONTARIO, CANADA

light. They are not considered suitable for organic finishing materials because of their tendency to fade in the film.

The second type of synthetic organic pigments, the insoluble azo pigments, are precipitated by diazotized or tetrazotized amino compounds acting on phenolic bodies. These pig-

ments, of which the Hansa yellows and oranges, the toluidine and chlorinated nitroaniline reds, and the toluidine maroons are the better known, possess good hiding power and, generally speaking, good durability and color retention. They wet easily in oil and have extensive use in paints, lacquers and enamels.

Soluble azo pigments differ from the insoluble type in that they are formed by a precipitation of acidic salts onto solutions or suspensions of dyes formed by the action of diazotized amino compounds and phenolic bodies. Some of the pigments so produced include Persian orange, amaranth maroons, lithol reds and acid scarlets. These pigments are considered to be non-bleeding in oil and lacquer solvents and are widely used in the finishing industry. They are semi-transparent and consequently do not possess the hiding power of the insoluble azo pigments but they do have great tinctorial power.

The condensation acid pigments are formed from many of the dyes used for textiles by precipitation with metallic salts such as barium chloride and aluminum chloride. The precipitate is absorbed on aluminum hydroxide or similar materials. Condensation acid pigments are not used extensively in finishing materials because they do not stand up well in sunlight. The reds, except those precipitated by lead, are used for tinting lipstick, rouge and face powder.

Anthraquinone and vat pigments include the indanthrene blues, yellows and greens, the alizarine blues and reds, indigo blues and reds and algol reds and oranges. They are somewhat expensive to manufacture both because of the chemicals used and the amount of labor required for the complicated chemical processing. They are, however, highly permanent and durable.

Into the miscellaneous group fall those chemical pigments not otherwise easily classified. They are often used as specialties in both printing inks and paints. Among the pigments put in this group are the indulines, the nigrosines, the sulfonated indulines, the sulfonated nigrosines, other sulfur colors, and some of the naphthol greens and yellows.

Color Measurement

Copies of Circular C429, having to do with photoelectric measurement of color, may now be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C.

A number of types of color measurement which can be made with any device having the components selected by the author of the circular are discussed. Its cost is ten cents.

PHOSPHATE COATINGS CONSERVE CRITICAL MATERIALS AND SPEED UP PRODUCTION

By W. K. CUSICK

Chief Engineer, International Rustproof Corp., Cleveland, O.

THE application of rust-resisting finishes to metal products is a vital problem in these days when certain metals are so urgently needed for our war program. Most methods for protecting iron and steel from rust involve the application to the surface of either paint or a metal that is more stable than iron. The phosphate coating methods are processes whereby the surface of the metal is converted to a water insoluble phosphate which is highly resistant to corrosion. Inasmuch as these processes do not require critical materials, they are of vital interest to everyone concerned with our war program.

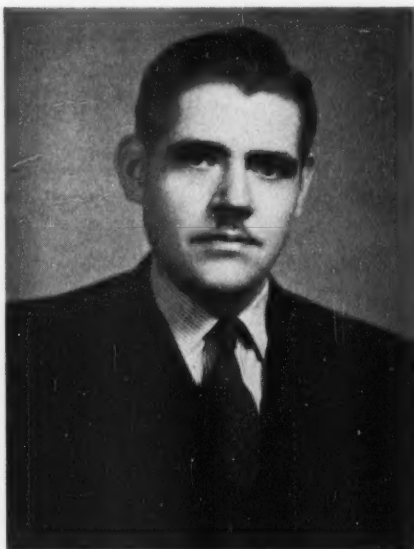
By the use of phosphate coatings great savings of copper, cadmium, zinc, tin, etc. have been made. To state specific cases where changes have been made might possibly give information helpful to the enemy; however, it may be stated that these coatings are being used on machine gun and rifle parts, shells, bomb parts, fuses, gas alarm signals, and countless other items where a definite need for a positive method of rust control is necessary.

Production on many of these items has been speeded up considerably due to the facts that these processes do not require as elaborate equipment as is generally necessary in plating and that in a great many cases it has been possible to expand production facilities by making use of equipment formerly used for other purposes.

Since the use of these coatings has been greatly accelerated as a result of our war effort, a general discussion of phosphate coatings, their uses, and advantages may be helpful at this time.

The different processes of phosphating consist essentially of immersing the clean metal to be treated in a hot solution, 180-210° F., made up of a proprietary chemical which, when mixed with water in the proper proportions, reacts chemically with iron, steel, zinc, zinc alloy, or cadmium, until the entire surface is converted to an insoluble rust resistant phosphate. (No reaction takes place with aluminum, brass, copper, tin, nickel, stainless steel, etc.).

The coating thus produced is made up of millions of microscopic crystals which are integral with the metal and therefore have good bonding qualities for paints, lacquers, enamels, stains, waxes and oils. The com-



W. K. Cusick

bination of phosphating with an organic finishing coating is a positive anti-rust treatment of outstanding value, and is not merely a substitute for a plating metal. It has been and is a standard method for past, present, and future years,—not just a temporary war expedient.

Phosphate Coating as a Paint Base

The difficulty in maintaining paint finishes is due to:

1. Corrosion of the metal under the paint film.
2. Lack of adhesion.
3. The durability of the paint film itself.

Phosphate coating is by far the most appropriate method of overcoming the first of these difficulties at the present, inasmuch as paint manufacturers have developed their products to such a degree as to give protection against nearly any and all types of corrosion conditions, if applied over a properly prepared surface.

Phosphate coatings by their formation of a microscopic, crystalline, non-metallic surface

prolong the life of paint films three to five fold, in the following way:

1. The fine crystalline surface, which is an integral part of the metal, provides a bond which is far superior to that formed by the deposition of another metal.

2. By being a water insoluble compound, it retards corrosion caused by the moisture that may penetrate the paint film.

3. It provides a check on cleaning operations and eliminates as far as possible the human element in obtaining satisfactory surface preparation prior to painting by neutralizing any residual alkali and surface rust as well as eliminating hand marks that may have accumulated prior to processing.

4. Should the paint film become scratched to such an extent that bare metal is exposed, the phosphated surface will retard the spread of rust back under the paint film and confine it to the damaged area only. This is due to its being a non-conductor and therefore blocking the electrochemical cycles which are the chief causes of corrosion.

As a Treatment for Zinc Surfaces Prior to Painting

When a paint finish is to be applied over a zinc surface the great handicap for many years has been the preparation of the surface, for if paint is applied directly over the surface without any preparation, either a reaction takes place between the zinc surface and the paint, causing it to lose its adhesive qualities and peel off easily, or, if the paint film becomes broken, a reaction takes place between the zinc and the atmosphere forming zinc salts which creep back under the paint film and cause this same lack of adhesion.

It has been the custom to either weather all zinc surfaces that were to be painted for quite some time or etch them with an acid. Both of these methods provide a fairly good base for paints but weathering is very slow and acid etching is quite expensive. In addition, both methods remove part of the metal, which results in not only loss of protection but also financial loss as the user paid to have this metal applied. The phosphate coating processes not only overcome

these disadvantages but actually provide a paint base that gives additional protection.

The phosphate coating processes are highly effective chemical treatments which provide a rust inhibiting bond between the zinc surface and the paint and thus not only provide a mechanical bond but also prevent any reaction from taking place between the paint and the metal. If the paint film should become broken, it prevents creeping of the zinc salts between this film and the metal itself, with the result that the paint finish has a useful life several times greater than it would have either without this treatment or with the slow weathering or expensive acid etching methods of preparation.

Phosphate Coating as a Final Finish

In using phosphate coatings as a final finish the articles, after being cleaned, processed, and rinsed, are treated with oil, wax, stain, or some other suitable substance, instead of paint or varnish. The method has the following advantages:

1. Being a conversion process and not an additional outer coating, (electroplated, galvanized, etc.) variations from original shape and dimensions are minimized and therefore manufacturing limits and tolerances do not have to be changed. Adequate protection can be given small screws, nuts, and articles containing small holes and recesses without destroying their close machining.
2. Being a chemical reaction, size and shape are no handicap and any article that can be totally immersed can be phosphated. (Plating, by requiring a flow of current to carry the metal onto the parts, tends to give a very heavy deposit on the portions closest to the anode and very little, if any, on recessed surfaces.)
3. Castings, forgings, stampings, screw machine and wire products may be processed in the same bath with the assurance that they are all getting the correct treatment as there need be no adjustment for these different items.
4. The phosphate coating process permits the handling of parts in the easiest and most economical way. Small parts may be treated in small baskets or tumbling barrels, while larger parts may be suspended from racks—it only being necessary that the solution be allowed to come in contact with the metal.
5. Phosphate coating requires no special training or skill in its operation and any dependable workman of average intelligence may be entrusted with its maintenance as no complicated laboratory control is necessary.
6. There are no harmful fumes given off and the solution is harmless to both the workmen and their clothes.

Phosphate Coating as a Wear Resistant Finish

Phosphate coatings are of inestimable value in the treatment of precision friction parts for the prevention of scoring and ex-

cessive wear during the break-in period. This is accomplished by dipping the processed parts in a soluble, or preferably, a graphited oil bath.

This treatment has the following advantages:

1. The fine crystalline surface provides a mechanical bond that retains the lubricant on the surface.
2. The coating will burnish down fast and set up a perfectly smooth, highly-polished friction surface.
3. Protection from corrosion is provided while parts are in stock prior to installation.
4. Protection from corrosion of certain types of lubricants is afforded.

When a graphited oil dip is used, the following advantages are also to be had:

1. A dry lubricant in place, ready to function upon initial movement.

2. An increased life for the coating due to the additional lubricating properties of the graphite.

3. Ability to hold two to four times more oil, due to the peculiar oil absorbent qualities of the graphite.

Tests conducted on this coating indicate that a metal loss of one to two thousandths of an inch can be expected on untreated parts before any appreciable wear can be measured on the treated parts.

In addition to the uses mentioned in this article, phosphate coatings have been used for the carrying of lubricants in deep drawing, to give adhesion to glue in joining cloth, leather, etc. to metal objects, and many other special uses which have been developed by cooperation of the technical staffs of the companies handling these processes and various manufacturing concerns.



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Flame-Priming Method of Preparing Steel Surfaces for Painting

By E. W. DECK

Development Engineer, Linde Air Products Co.

RESearch into the protection afforded steel surfaces by painting indicates that the preparation of the surface is equally as important as the paint itself. The surface, in addition to being cleaned of loose scale, rust and contaminants, should also be dry and warm, because it has been shown that as little as a single molecular layer of moisture or some other incompatible material on the surface will not only prevent satisfactory bonding on the base coat but will permit corrosion to continue after the coat has been applied.¹ On a warm, dry surface, the paint will flow readily, continuously wetting the entire surface and carrying the inhibitors into intimate contact

The latest findings on the increased corrosion resistance of steel surfaces that have been flame-primed before protective painting and an investigation into the chemical aspects of rust and mill scale. This is the first of a two-part article on the subject.

with the surface where they are needed for effectiveness.

While the beneficial effects of painting on a clean, warm, and dry surface have long been realized, it was not until the oxy-acetylene flame-priming process was introduced several years ago that all three of these desired conditions could be achieved. Following its introduction, flame-priming has proved its efficiency, speed, and economy in theory and practice, as evidenced by the fact that well over 20,-

000,000 square feet of steel surfaces are now being treated by this process each month.

Principles of Flame-Priming

The flame-priming process consists of "scrubbing" steel surfaces with a series of closely spaced oxy-acetylene flames that have an extremely high temperature and velocity. As a result, all mill scale that is not tightly bonded is popped loose by sudden thermal expansion, and physically adsorbed and chemically combined water are driven off from any rust that is present, leaving stable oxides in their place. At the same time other contaminants such as oil and acid salts are consumed or disintegrated by the flames. The surface is then swept or wiped free of loosened foreign material, and painted while still at an elevated temperature.

This procedure not only brings about improved corrosion resistance of the paint coating, but also increases cleaning and painting rates and reduces setting time for the paint. As a further advantage, painting can be carried out under conditions of low ambient temperature or dampness which would otherwise cause major delays. The time saved with the process is of particular importance at present when continuous production without delays in the fabrication and painting of steel is required.

It should be noted here, that the term "flame-priming" is now designated for the process at the suggestion of many industrial users. It is felt that the word "priming" best expresses the effect of the process, not only upon the surface to be painted but because

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The Iron Age, October 22nd, 1942)*

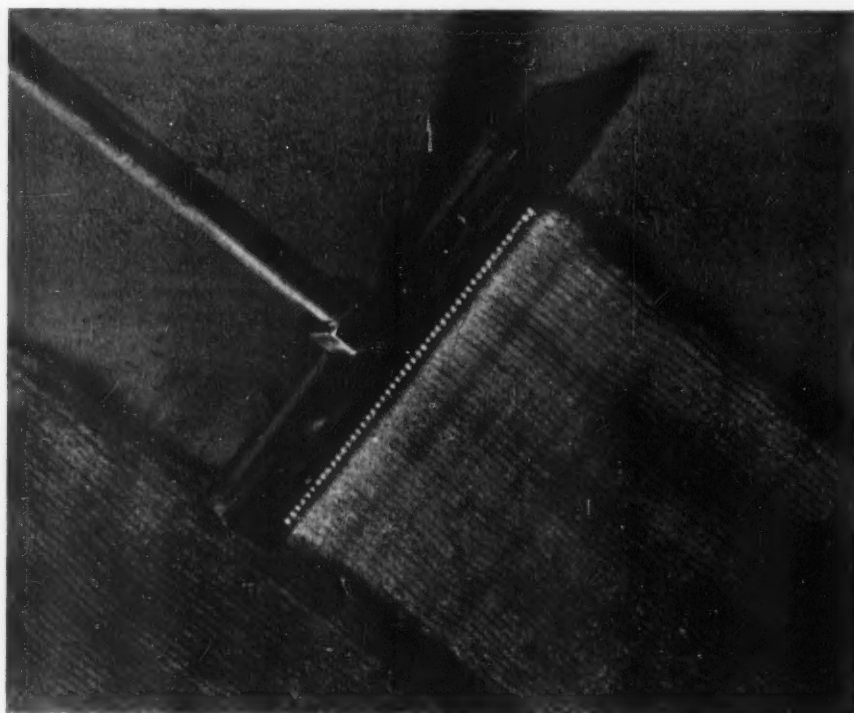


Fig. 1—In flame-priming, loose scale is popped off and rust is dehydrated and loosened, leaving a warm, dry surface that can easily be cleaned to receive the paint coat. The dark streaks that appear on the plate surface are black magnetite, and the silvery streaks between them are sponge iron. Both are granulated products of rust that can be easily swept off the surface. Any particles that remain will be absorbed in the paint with no harmful effects.

it also implies an effect upon the paint coat itself. In addition to cleaning and drying the surface, it heats the metal, thus giving the subsequent paint coat the effect of a low-temperature bake. For this reason, flame-priming would seem a more expressive term than flame-cleaning, descaling, or dehydrating. These latter terms are still widely used for those applications where no paint is applied in conjunction therewith or where it is applied at a later date.

Flame-Priming Equipment

The rigorous heating action in flame-priming is produced by flame-priming heads, ranging in widths from 1—12", which can easily be attached to standard welding blowpipes, either directly or by means of an extension arm. The entire unit, shown in Fig. 2, is light, well balanced, and easy to handle. The head is protected from wear or damage in use by means of hard-faced wear pads and skids, which also serve to keep it automatically at the correct distance from the work. A 6" head, the size most frequently used, has 49 flame ports that are spaced $\frac{1}{8}$ " apart, and are No. 75 drill size, or approximately 20 thousandths of an inch in diameter. Despite this extremely small diameter, the flames are over $\frac{1}{4}$ " long, indicating the extremely high velocity of the burning gas jets, which increases the "blasting" effect of the flames and therefore their efficiency.

Because of the high velocity of the flames and the design of the flame ports, these flames are extremely resistant to popping or clogging under the most severe operating conditions. Technique of manipulating the blowpipe is easily learned and requires no special skill. In fact, painters, with no previous experience in use of the oxy-acetylene process, have been trained in five minutes to do flame-priming satisfactorily.

The ready portability of all equip-

ment necessary for flame-priming, including supply sources of oxygen and acetylene, makes the process equally adaptable for use in the field and in the shop. In the shop, oxygen is usually supplied by a piping system and acetylene from a generator, while in the field, oxygen and acetylene are usually supplied from manifolded cylinders.

Effect of Flame-Priming on Rust

In any discussion of the effects of flame-priming on rust, some mention should first be made of the nature of this product of corrosion. Rust is an interbonded chemical and physical adsorption of water with iron oxides.² The rust normally encountered on steel work is the wet, reddish brown precipitate resulting from the oxidation of the ferrous hydroxide that has been formed by the action of water upon iron. This precipitate is a hydrated iron oxide having varying amounts of physically and chemically adsorbed water. The physically adsorbed water is the moisture which can be seen or felt, while the chemically adsorbed might be considered comparable with waters-of-crystallization.

A thorough wire brushing alone is not sufficient to prepare a rusted surface for painting³ since this physical wetness causes the rust particles to adhere with a persistence that defies brushing. In flame-priming, however, depending upon the surface temperature reached and the length of time it is maintained, a series of reactions takes place beneath the flames which reduces this wet, hydrated oxide to ferroso-ferric oxide or even to sponge iron, both of which are loosely bonded, granulated powders that can readily be brushed away.

The heat first dries out the physically adsorbed moisture, and breaks down the rust, leaving an anhydrous oxide.⁴ Simultaneously, the reducing gases in the flames⁵ react chemically

with the oxides to reduce them to ferroso-ferric oxides or black magnetite, which is highly stable.⁶ The formation of this black powder, which in most flame-priming operations gives the surface its characteristic appearance, indicates that all moisture has been driven off.⁶ Thirty years ago it was conclusively⁷ proved that such a surface would be desirable for painting but at that time oven-baking was used and was not practical for most work.

The deoxidizing action which reduces the surface rust to black magnetite can be continued still further to reduce the surface particles to sponge-iron by moving the flames more slowly over the surface. It is only a superficial effect and occurs only in the reducing atmosphere at the tip of the inner cone flame as shown in Fig. 1. If this granulated powder be brushed lightly, it would be found that the sub-surface layers were not discolored or deoxidized. Only the moisture would have been driven off; the reducing gases would not have diffused to any great depth. Nor is it necessary that they should. Tests⁷ show that dehydration alone is sufficient. The discoloration serves to indicate that the dehydration of the sub-surface is complete and thereby is the perfect index of satisfactory speed of treatment.

The warm, dry, granulated powder produced when rust is treated with oxy-acetylene flames can be swept from the surface with a light brushing. It is very porous, and, therefore, tends to pick up contaminants as soon as it cools. Because of this "activated" condition, it should be either brushed away before painting or painted while hot. If it is painted hot, the absorptive characteristics insure its thorough blending into the coat where it becomes a portion of the pigment. It is of the same composition as part of the pigment used in many present day anti-corrosive coatings. In this connec-

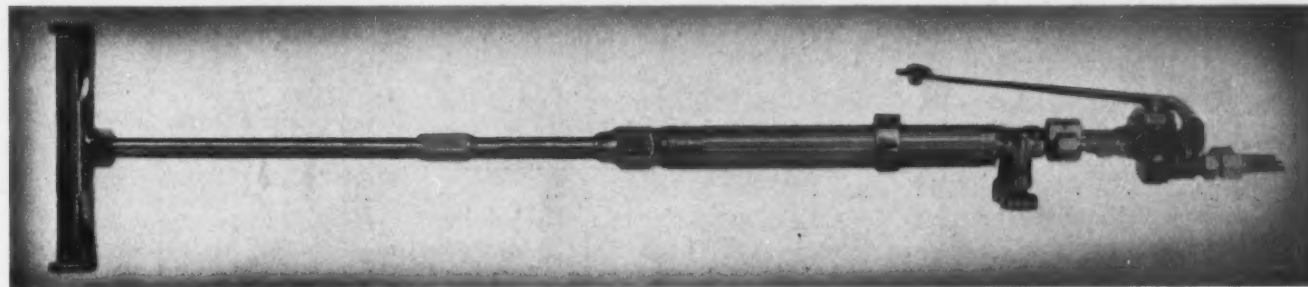


Fig. 2—Apparatus requirements for flame-priming are simple, consisting of a flame-priming head attached to a standard welding blowpipe, either directly or by means of an extension arm. The flame-priming head is designed to produce a series of special high-temperature high velocity oxy-acetylene flames which produce the stringent heating necessary to remove scale.

ACTION OF MILL SCALE ON STEEL

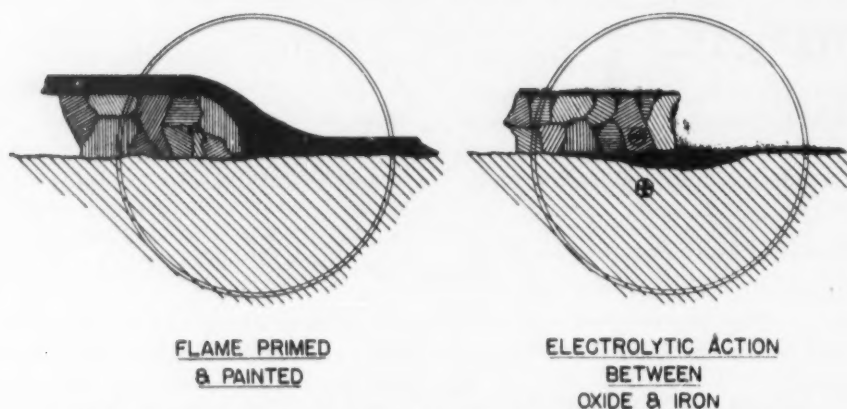


Fig. 3—Flame-priming eliminates the scale problem by removing that which is loose and dehydrating that which is tight. Tests show that scale so treated serves as a protection even when the paint coat fails.

tion it should be emphasized that the surface should be painted while still warm.

Effect of Process on Mill Scale

Prior to the advent of flame-priming, scale on steel surfaces was a major problem. Wire-brushing did not remove all that was loose enough to flake off as the paint coats set, and also the invisible (but nevertheless present) moisture on the surface and in the rust, set up small electrolytic cells between the iron oxide and the steel. These cells concentrated their etching action across the shortest path, the bond between the scale and the steel, and thereby continued to loosen more scale. This action is illustrated in the right hand sketch of Fig. 3.

Flame-priming not only corrects this fault of mill scale but in doing so, it renders it advantageous in that its presence prevents corrosion when the paint coat fails. In the right hand sketch of Fig. 3, the surface has been flame-primed, wire-brushed, and painted. The flames have forcibly removed all scale which could conceivably be considered loose. The paint has been applied on the warm, dry, surface with the result that its surface tension and viscosity have decreased. The improved mobility causes the vehicle to penetrate all irregularities bringing the inhibitors into intimate contact with the surfaces where they are necessary for effectiveness in the event that water eventually penetrates. Any fissures in the scale are sealed and the junction of the scale and steel receives an extra fillet of protection. In addition to this, the coating is baked by the heat, reducing voids and effecting longer life.

Should such a surface be exposed without additional coating, it is obvious that the scale would serve to protect the metal beneath long after rusting had started on the unscaled portion to the right. This is shown later by actual tests.

From this discussion it should be obvious that it would be desirable to obtain steel with the maximum amount of tight scale intact⁸ and paint it before any rusting could spread from the exposed area to undermine the protective layer. This, of course, is not practical, but flame-priming is the nearest artificial approach to this condition. It has been further pointed out by actual tests⁹ that the less rusting which takes place before flame-priming, the more scale will be left intact and the more corrosion resistance will be afforded. The U. S. Navy points this out in their specifications on this process which require that the steel be painted as soon as possible after arrival at the yard.

In flame-priming, the removal of scale results from two similar forces: either a differential expansion between the entire scale layer and the base metal; or the differential expansion between top and bottom surfaces of the scale. In the removal of heavy scale in which heat conductivity is low, the expanding force of even a relatively slow heating rate will cause the scale to expand and buckle off the base metal before the base metal shows any tendency to become hot.

On structural shapes and relatively thin plates that have been finish-rolled at relatively low temperatures, there usually is a good thermal bond in addition to the physical bond between scale and base metal. Consequently

in its removal there is a tendency for heat to be conducted away almost as fast as it is poured into the surface. It is necessary, therefore, to supply heat to the top surface of the mill scale at a rate so high that it exceeds by far the rate of conduction away from it. In this manner, a superficial expansion takes place while the base metal and scale interface are still relatively cool and brittle. Special oxy-acetylene flames have been developed for this application. The flame ports are designed to produce exceptionally high velocity and high temperature flames capable of producing a sudden heating action with extremely low consumptions.

Flame-priming, while removing the loose scale and dehydrating rust, does not remove any scale that, because of its tight bond, would serve as a protection against corrosion. It has been shown that any scale that can resist the stringent expanding action of the sudden heating effect of high-temperature, high-velocity flames is sufficiently tight to resist subsequent flaking. In fact, to bring about a margin of safety, flame-priming actually removes some scale which could be satisfactorily left on because of its high bond strength.¹⁰

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(In the next installment, the author will continue the discussion of flame-priming as a preparation for steel surfaces prior to painting and will cover specifically the subjects of operating temperatures and their effects on coatings, evaluation tests, operating data and the applications of flame-priming.)

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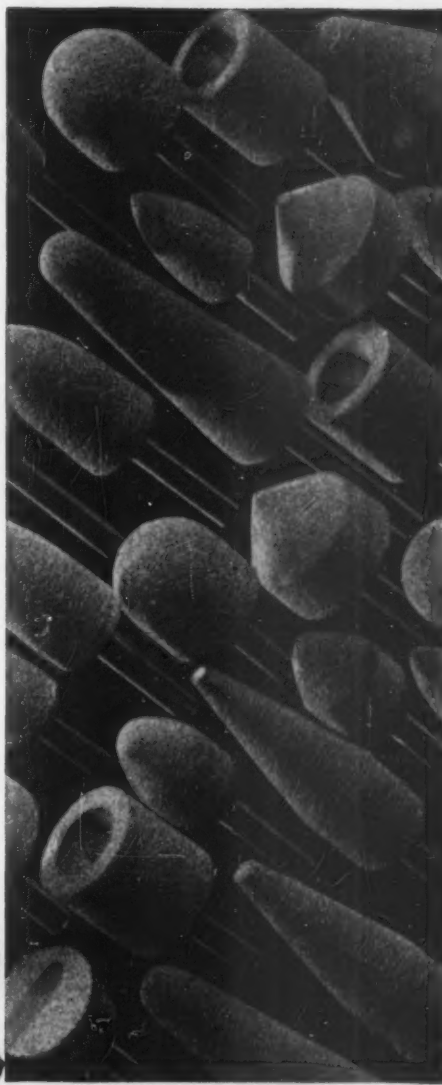
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The Young-McArdle Viscometer which facilitates determining viscosities of polymer solutions and other liquids that are so viscous they cannot be conveniently tested by other methods is now being offered by R. P. Cargille, 118 Liberty St., N. Y. C.

It provides liquids of certified viscosity sealed in matched glass tubes $4\frac{1}{2}$ " x 1" with empty, matched tubes for the samples to be tested.

Viscosity is determined by inverting the tubes and comparing the rise of an air bubble in the sample with the rise of bubbles in the known standards. The air bubble in the heaviest standard requires about three minutes to rise. The procedure is said to require no special experience and to save much time over other methods. It should be useful for testing highly viscous liquids used in protective finishes.

Substitute For Carbon Tetrachloride

The Curran Corporation, 6 Pleasant St., Malden, Mass., has announced the development of a solvent to replace carbon tetrachloride.

The new material is described by the company's research director as a volatile, water-white, methalated hydrocarbon solvent which evaporates clean, is non-flammable and non-explosive, and is characterized by its quick cleaning and dissolving action on gums, oxidized oils, burnishing compounds, etc.

The new product is said to be 14 times

faster than naphtha in cutting gummy and tarry dirt. It is a "non-polar" solvent and unlike the chlorinated solvents, induces no corrosive or rusting tendency of ferrous metals. It is much less toxic than carbon tetrachloride which it is intended to replace. It is also said to be substantially lower in cost than carbon tetrachloride.

Graduated Testing Tubes

Graduated glass tubes suitable for use in finishing departments and finishing laboratories are now available from R. P. Cargille, 118 Liberty St., New York, N. Y. These tubes, with ring graduations from one to eight cubic centimeters, are especially useful for checking the solubility and compatibility of thinners with finishing materials, the settling rate of pigments in finishing materials, and similar procedures. They possess the advantage of being handled like a test tube and since the use of a burette or graduated cylinder is not necessary, both time and materials may be saved in making finishing material tests.

Spray Equipment

An interesting 32-page, $8\frac{1}{2}$ x 11" booklet entitled "Eclipse Spray Equipment on the Job" has just been issued. The pictures of actual spray operations in various industries such as shipbuilding, aircraft, baking (spraying grease on bread pans), machinery, leather, structural steel, and munitions, will give the reader some idea of the scope of the equipment's application. Comments from several users reflect satisfaction with the results obtained.

The Eclipse Air Brush Co., Inc., 400 Park Ave., Newark, N. J. will be glad to send a copy of the booklet free to any one requesting it on company letterhead.

Water Paint

In the current issue of "Pittsburgh Plate Products," publication of the *Pittsburgh Plate Glass Co.*, Grant Building, Pittsburgh, Pa., announcement is made of a new, quick-drying water paint of the resin emulsion type called "Techide". This material, which comes in a variety of soft textured colors, requires none of the ordinary thinners to prepare it for use. It is reduced with fifty per cent by volume of water and is said to cover 400-1000 square feet per gallon. It may be applied over surfaces such as cement, brick, old paint, wallboard and even wallpaper. Included in the announcement is a brief discussion of the development of water paints including whitewash, calcimine and casein paint.

Vinyl Chloride-Acetate Resins

The current quarterly issue of "The Bakelite Review," published by the *Bakelite Corp.* and the *Plastics Division of Carbide and Carbon Chemicals Corp.*, 30 West 42nd St., New York, N. Y., includes a discussion of protective coatings of vinyl chloride-acetate resins in which a summary of their various properties is given.

It is pointed out that when these resins are correctly formulated and applied from solution in organic solvents they yield finishes of unusual toughness, gloss, adhesion and chemical resistance. The various grades of vinyl chloride-acetate resins for surface coatings are listed and typical applications for coatings made from these resins are given along with tables of resistance to various organic and inorganic chemicals.

This review also features an interesting discussion of industrial camouflage by means of coatings.

Chemical Catalogue

Glyco Products Co., Inc., 230 King St., Brooklyn, N. Y., are the publishers of a new edition of "Chemicals by Glyco", a 112-page catalogue embracing a 35-page section on suggested formulas and chapters on the following: polyhydric alcohol esters; emulsifying agents and special emulsions; flame and water proofing; water-soluble and insoluble resins; wetting and foaming agents; defoaming agents; synthetic waxes; preservatives; deodorizing agents; plasticizers, flexibilizers and solvents.

The book is completely indexed, has informative tables and a list of the company's representatives in this country and abroad.

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For the past 4 years Enthone strippers have been used by hundreds of manufacturers for quickly removing organic finishes from civilian goods.

And NOW—fast working, patented* Enthone strippers are helping to speed the flow of war goods.

Here's what Enthone strippers do:

- ★ Strip synthetics, japans, lacquers rapidly.
- ★ Leave all metals clean and bright.

SPECIAL STRIPPERS for SPECIAL PROBLEMS —
TELL US YOUR PROBLEM!

THE *Enthone* co.
NEW HAVEN, CONN.

*Protected by U.S. Patent No. 2242106

The Reclamation of Hardened Used Paint Brushes

By W. B. GERTZ

Michigan College of Mining and Technology

SINCE the issuance of the limiting orders covering bristles and paint brushes by the O.P.A., we have come to better appreciate the long pure bristles of pre-war paint brushes. The new war-time paint brush is but another example of a commonplace item suffering from the want of a necessary imported constituent, the source of which is now controlled by our enemies.

Soaking in Solvents

Dirty brushes to be cleaned by the following method should be in the hard condition. Brushes which are still soft and which require cleaning should be removed and left in the air a few days to harden. The removal of the hardened paint from the individual bristles depends on the destruction of the adherence of the film to the bristles through the use of a swelling agent such as is used in paint and varnish removers. Once the adherence between the film and bristle has been destroyed, the loosened film may be easily washed away.

From the standpoints of swelling effectiveness, evaporation rates and cost, the best swelling agents are the esters such as amyl acetate, ethyl acetate and butyl acetate. Alcohols, also used in paint and varnish removers, may be used as swelling agents but they are not as effective as the esters. In addition, they are miscible with water and therefore will not permit emulsion cleaning as required in this procedure.

The brush is placed in a metal container. Sufficient swelling agent is added to cover the brush to the ferrule. After standing for several hours, or overnight if necessary, the brush is removed, the excess solvent is squeezed off against the edge of the container and the brush laid on newspaper. With a stiff putty knife, spatula or scraper, the softened and loosened film is removed from both bristles and ferrule.

Particular care should be taken at this point that the bristles are not cut. A wire brush often helps in dislodging loosened film from the bristles near the ferrule.

Usually one soaking in swelling agent is sufficient to loosen all contamination. If most of the swelling agent is squeezed from the brush into the container, a saving is made in solvent since the same solvent may be used a number of times for the swelling action.

Double Agent Cleaner

The next operation, which should be started before the brush has dried out, is the complete washing out of the loosened film. This washing is done preferably in a container such as an enameled pudding pan. A quarter teaspoonful of trisodium phosphate or similar cleaner is dissolved in about five tablespoonfuls of water. About one tablespoonful of any of the swelling agents mentioned above is then added and the brush is worked vigor-

ously in the mixture. Softness will return almost immediately to the bristles. This cleaner must penetrate to the heel of the brush before the brush is washed with soap and water. The washing will have to be repeated several times before suds can be developed. Then the brush is rinsed thoroughly in fresh water, the excess water is squeezed out and after smoothing the bristles, the brush is wrapped in paper so that it will dry to the proper shape.

The successful cleaning of the bristles depends chiefly on the emulsion or double-agent cleaner made of the alkaline material and the ester. The cleaning action of these two constituents, working together, puts the material to be removed from the brush into water suspension much more effectively than either of them could alone.

If the details of the procedure as outlined are carefully followed, the bristles of the cleaned brush will be as soft and flexible as those found in a new brush.

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Bench Type Marschke
Buffer. 1 and 2 HP.



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"finishes"
the best

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Indianapolis,
Indiana.

Hercules Powder Changes

Could Grant Rheuby retired from his positions as vice president, director, and member of the finance committee of *Hercules Powder Co.*, at the meeting the board of directors held on Jan. 27, 1943. He had served the company since April 1, 1913, only three months after it had commenced business.

At the same time, the resignation of Charles A. Bigelow from the executive committee was announced. Mr. Bigelow, who is also a vice president, has been elected to

succeed Judge Rheuby on the finance committee.

No successor to the position of vice president was elected. Memberships of the board of directors and executive committee were each reduced by one, leaving no vacancy.

Judge Rheuby, who was judge of the 47th Judicial Circuit of Indiana from 1904 to 1909, joined Hercules as its General Counsel in April, 1913, and held that post until March 31, 1939. On March 5, 1918, he was elected a member of the board of directors, and in 1930, he also became a vice president.



DETREX 4-STAR SERVICE

- ★ Unbiased recommendations on cleaning methods best suited to your product.
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Whenever you are faced with problems in connection with your metal cleaning operations . . . when you want advice on the cleaning of new products, special handling, draft elimination, heat balance, proper spraying of solvent, or other details of correct operation and maintenance of cleaning equipment . . . call in a Detrex Service man.

A DETREX MAN Is THERE When You Need Him



The conveyorized vapor-spray-vapor Detrex degreaser shown above is used to clean 20 mm., 37 mm., and 44 mm. shells in baskets prior to painting.

Detrex men — backed by a company with 22 years of metal cleaning experience — can be of assistance to your engineers, finishing foremen, and machine operators. Their services are available without obligation.



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Solvents In Industry

Mesityl Oxide

(isopropylideneacetone, 4-methyl-3-pentanone-2, methylisobutenylketone)

Mesityl oxide is a member of the unsaturated ketone group of organic compounds. It is an oily liquid with a peppermint-like odor. In the pure state it is water-white, although the commercial product may be light yellow or straw in color. It has the chemical formula $(CH_3)_2C:CHCOCH_3$. Its molecular weight is 98.14, differing from that of diacetone alcohol from which it is derived by the molecular weight of water.

Mesityl oxide is a solvent for a variety of materials, including nitrocellulose, ethyl cellulose, gums and waxes, some grades of cellulose acetate and many of the vinyl resins and vinyl chloride plastics. It is classed as a medium boiling solvent. Based on $\frac{1}{2}$ second R. S. nitrocellulose, its dilution ratio with respect to toluol is 4.3; with respect to low aromatic petroleum diluent, 1.0.

Mesityl oxide is miscible with many organic solvents. Its solubility in water at 20° C. is 3.1 per cent by weight. Water is soluble in it to the extent of 3.1 per cent by weight at 20° C. It forms a constant boiling mixture with water. This mixture contains 65.2 per cent by weight of mesityl oxide and boils at 91.8° C.

Pure mesityl oxide is listed as having a specific gravity of 0.8546 at 20/4° C. (approximately 7.13 pounds per gallon at 20° C.). At 760 mm. mercury pressure, its boiling point is 129.5° C. Its freezing point is -59° C. The specific heat of mesityl oxide is 0.521 calories per gram between 21° and 121° C. Its coefficient of expansion is 0.000599 per °F. Its latent heat of vaporization is 85.8 calories per gram. At 20°, 30°, and 40° C. its vapor pressure is 8.0 mm., 14.3 mm., and 24.5 mm. of mercury, respectively. Its evaporation rate (0.9) is slightly less than that of normal butyl acetate, 90 per cent grade, (1.0) and somewhat greater than that of ethyl alcohol (2.7). The flash point of mesityl oxide, as measured in a closed cup apparatus, is 83° F.

Chemical Properties

Because of the double bond in the chemical structure of mesityl oxide, it is more reactive than the saturated ketones. It is subject to slow oxidation and polymerization, usually accompanied by the formation of colored products. Mesityl oxide forms peroxides during storage in contact with air and proper precautions should be taken if distillation operations are undertaken. On boiling with dilute alkali, mesityl oxide undergoes cleavage with the regeneration of acetone.

Uses

Because mesityl oxide is an excellent solvent for nitrocellulose, gums and resins, etc., it is particularly suitable for use in organic finishing materials. Nitrocellulose solutions containing mesityl oxide have low viscosity, excellent tolerance for hydrocarbons and a high resistance to humidity. Finishing materials of the vinyl resin type made with mesityl oxide give films with high gloss and excellent flow and can be sprayed without cob-webbing.

In addition to its use as a solvent, mesityl oxide is a valuable material for chemical synthesis.

Specifications

Given below are specifications on one grade of commercially available mesityl oxide.

Purity — Not less than 95% mesityl oxide by weight.

Acidity — Not more than 0.05% calculated as acetic acid.

Water — Miscible without turbidity with 19 volumes of 60° Be. gasoline at 20° C.

Color — Straw yellow.

Distillation

Range — Below 120° C., None. Above 135° C., None. More than 95% distills over below 131° C.

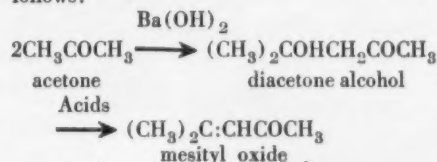
Specific

Gravity — 0.853 to 0.856 at 20/20° C.

Weight — Approx. 7.12 lbs. per gallon at 20° C.

Manufacture

Mesityl oxide is formed by heating diacetone alcohol (obtained from acetone) with a trace of acid or iodine. These reagents cause an almost quantitative dehydration of the hydroxyl ketone with the formation of an unsaturated ketone. The reaction is as follows:



It is also possible to obtain mesityl oxide directly from acetone by the action of acids. However, the yields obtained by this method are very poor.

Physiological Effect

Mesityl oxide is more toxic than the saturated ketones and precautions should be taken to avoid continuous breathing of the fumes. As with all organic solvents, proper ventilation should be provided in areas where the material is used.

Patents

Coating Composition

U. S. Pat. 2,305,920. R. Endres (Germany) vested in the Alien Property Custodian, Dec. 22, 1942. A composition of matter suitable for the production of stable plastic masses, coating compositions and the like comprising a cellulosic base selected from a member of the group consisting of cellulose ethers and esters, and as a plasticizing and dissolving agent a tetrahydrofurfuryl ester of an ether of a lower molecular aliphatic mono-carboxylic acid wherein the radical joined to said aliphatic radical through the ethereal oxygen atom contains at least 6 carbon atoms.

Coating Composition

U. S. Pat. 2,310,867. E. C. Pitman, assignor to E. I. duPont de Nemours & Co., Feb. 9, 1943. An improved coating composition comprising a plurality of film-forming ingredients one of which is dynamite type cellulose nitrate as an essential ingredient, and a liquid volatile vehicle containing at least one active solvent for the film-forming ingredients, the said dynamite type cellulose nitrate being present in amount less than 3% of the total composition.

Organic Composition

U. S. Pat. 2,308,879. E. Hirsch (Austria), assignor to E. I. duPont de Nemours & Co., Jan. 19, 1943. A water paint of brushing consistency containing about 120 parts of Congo gum dispersed in an alkaline solution, about 400 parts of glue, about 170 parts of urea, about 450 parts of casein and about 800 parts of latex (60% solids).



FOR VICTORY IN 1943

Speed up Production with IRCO-IZING

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● Save critical metals and use IRCO-ZINC COAT instead!

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Production on these materials has been speeded up considerably because the IRCO-IZING PROCESS does not require elaborate equipment as is generally required in plating and it has been possible to expand production by making use of equipment formerly used for other purposes.

So get behind the gun and use the quickest possible method to get at the enemy by installing the IRCO-IZING PROCESS.

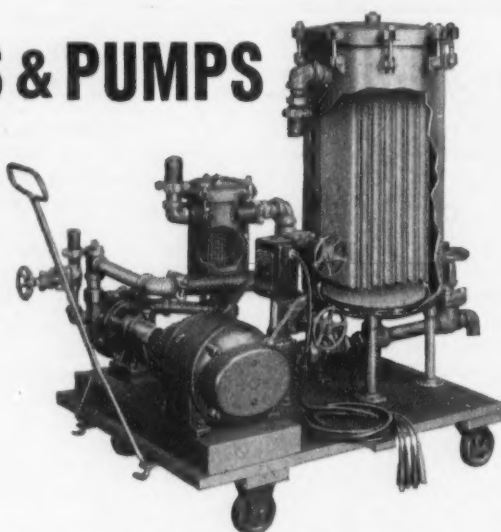
The IRCO-IZING PROCESS fully meets government rustproof specifications—easy to install—only two tanks required. Further information and literature sent on request.

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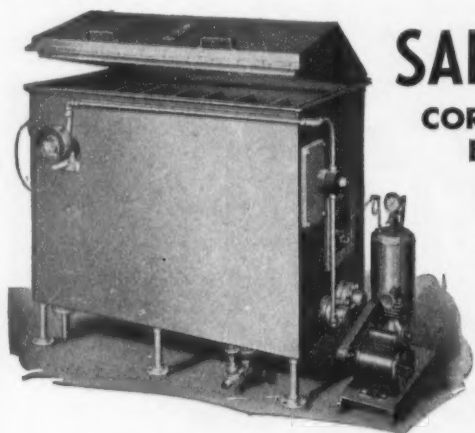
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Shop Problem

Problem 7. Shop-Mix versus Ready-Mix

Problem: The finishing department of a metal goods manufacturer has been using a finishing material made according to the following formula:

Color paste	1.5 lb.
Clear vehicle	1.0 gal.
Thinner	0.5 "

This formula makes up to 1.66 gallons. The costs of the various ingredients are: color paste, \$0.68 per pound; clear vehicle, \$1.30 per gallon; thinner, \$0.50 per gallon. The cost of mixing this material is taken at three cents per gallon. Production records show that one gallon will cover 236 pieces.

A ready-mixed, ready to use (no thinning necessary) finishing material is offered to the finishing department to replace the shop-mixed material. Tests indicate that the ready-mix is equal in quality to the shop-mix. If 3.84 gallons of the ready-mix are required to finish a thousand pieces, what would its price per gallon have to be in order that it be competitive with the shop-mix?

Solution: From the data given, the material cost per gallon of the shop mix is

$$\frac{(1.5)(0.68) + (1.0)(1.30) + (0.5)(0.50)}{1.66}$$

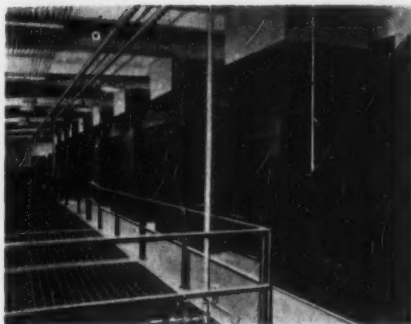
= \$1.55. To this must be added the cost of mixing, making the total cost per gallon $1.55 + 0.03 = \$1.58$.

Therefore, the finish cost per thousand pieces using the shop-mixed material is $\frac{1.58}{236} \times 1000 = \6.70 . Now, since

3.84 gallons of the ready-mixed material are required to finish a thousand pieces, it must not cost more than $\frac{6.70}{3.84} = \$1.74$ per gallon if it is to be

competitive with the shop-mixed finishing material.

BINKS INSTALLS LARGE THREE DECK SPRAY BOOTH



Binks Manufacturing Co., 3114-40 Carroll Ave., Chicago, Ill., recently installed what is believed to be one of the world's largest three-deck spray booths, for a large Mid-West aircraft manufacturer.

This new type spray booth is 150 feet long, and over 30 feet high. Three sets of water curtains, one above the other, wash the air and carry out the fumes and overspray in the painting operation.

Also illustrated is the equipment room, which houses the motors, starters, blowers and pumps necessary for the operation of the three-tier spray booth.



Pittsburgh Plate Glass Changes

E. D. Griffin, vice president, Pittsburgh Plate Glass Co., announces that Louis F. Theurer, industrial sales manager, Milwaukee Paint Division, has been appointed West Coast Divisional Director, succeeding Floyd S. Green, who is retiring. Mr. Theurer began his new duties March 1. R. I. Ogle, industrial paint sales representative in the Chicago territory, will be industrial sales manager at Milwaukee.

Mr. Green retires after long and distinguished service with the company. In 1903 he joined E. D. Timms in the paint business. In 1917 when the Patton Paint Company

absorbed the Timms organization, Mr. Green was transferred to Milwaukee as industrial paint sales manager; later he spent three years at General Office in Pittsburgh before going to the West Coast in 1931 to organize the new company division.

Mr. Theurer joined the company at Milwaukee in 1919 after serving abroad in World War I. After preliminary training he was assigned the Chicago territory, selling industrial finishes. He was appointed manager of industrial paint sales, Milwaukee, in 1935.

Mr. Ogle, an Ohioan, joined the company in 1919 and has been industrial paint sales representative at Chicago for many years.

DeVilbiss Wins Army-Navy "E" Award

During impressive ceremonies at its Toledo plant on January 11, The DeVilbiss Company and its employees were presented with the Army-Navy Award for high achievement in the production of the materials of war.

In the eyes of the Army and Navy the performance of the people of DeVilbiss has been outstanding not because they are producing guns, tanks or bullets, but because they have distinguished themselves in adapting their peacetime products to the job of war.

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Write or wire for complete information and prices.

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Protect Metal Surfaces

*with Johnson's
Rust Inhibiting Waxes*



Today, rust is a real enemy of much war equipment. To help guard against it, the makers of Johnson's Wax have developed special Rust Inhibiting Waxes for use on untreated metal surfaces and on black oxidized and phosphated surfaces. These new waxes also provide a desirable dry finish. They are easy to apply, either by dip or spray methods. Coverage per gallon is excellent; drying is rapid.

Johnson's Rust Inhibiting Waxes are non-toxic, non-flammable. They come ready to use; no mixing or dilution is necessary.

Free test sample and full information
gladly sent on request. Write

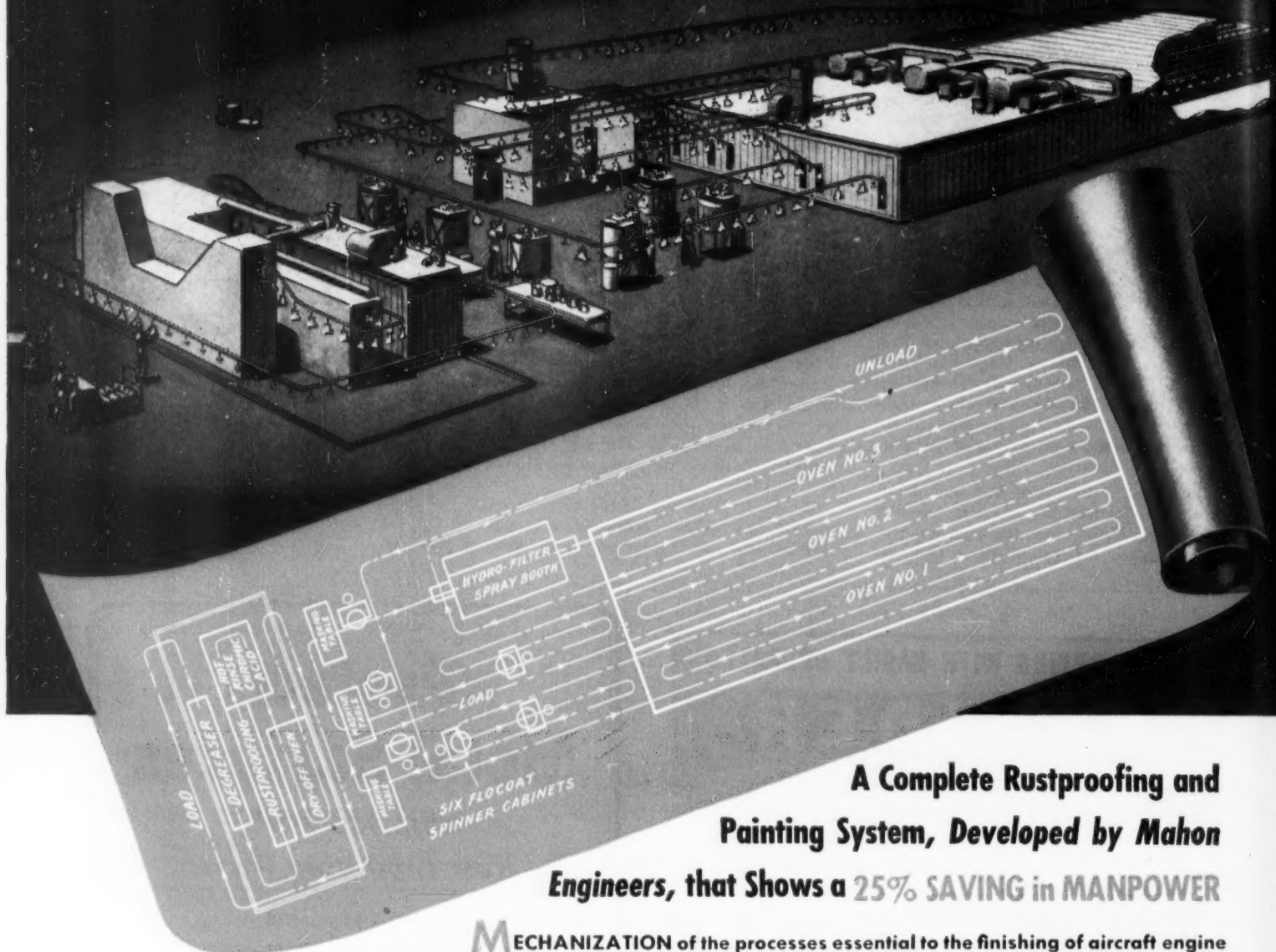
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Finishing System for Aircraft Engine Cylinder Assemblies



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MECHEANIZATION of the processes essential to the finishing of aircraft engine cylinder assemblies is effecting important economies for the aircraft industry. This Mahon installation established a saving of 25% in manpower—35% in production cost.

Previously, much of the work was done by hand. Now—it moves in a steady flow by automatic overhead conveyor through degreaser, rustproofing tank and dry-off oven. From here it is transferred to masking tables and thence by conveyor again through 3 painting and baking processes (2 flo-coat and 1 spray painting). Each painting and baking process is a separate operation, yet so skillfully has arrangement and plan of travel been engineered, the flo-coat spinner-type cabinets, hydro-filter spray booth and the extensive 3-compartment baking oven occupy a relatively small floor area.

Other similar systems now are in operation—more are in the planning stage. They represent tangible examples of the savings in time, in money and manpower that Mahon engineering and equipment is accomplishing in the aircraft and other vital industries where finishing and processing operations are an important part of production.

These built-to-the-job Mahon Products are saving time, money and manpower in essential war industries. Metal Cleaning Machines, Rust-Proofing Machines, Hydro-Filter Spray Booths, Filtered Air Supply Systems, Ovens—including Drying, Baking, Core and Box Types, Hydro- and Foam Dust Collectors, Complete Finishing Systems and Many Other Units of Special Processing Equipment.

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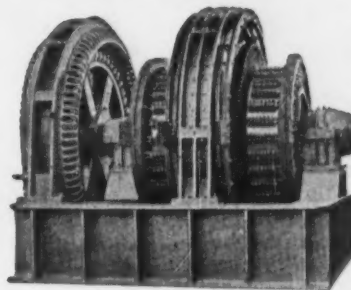
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Electrochemical Engineer

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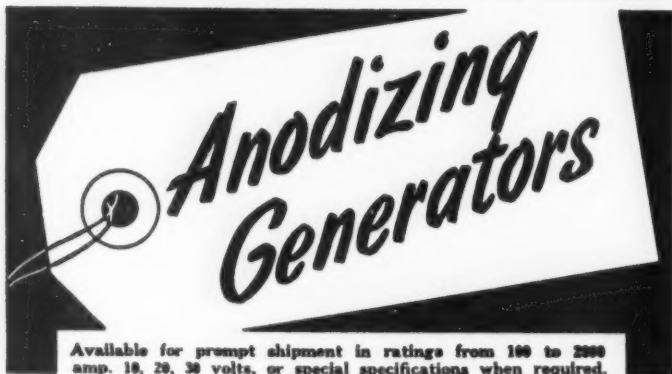
or Engineer to take charge of industrial plating in a new plant in Eastern Massachusetts. In replying, state age, draft status, education, experience and salary desired. Address March 1, care Metal Finishing, 11 West 42nd St., New York.

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Experienced sales representative desires connection with medium sized cleaner manufacturing factory. Eastern territory. Sales Representative, care Metal Finishing.

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American Electroplaters' Society

31st ANNUAL CONVENTION

BUFFALO, N. Y. • HOTEL STATLER

June 7, 8, 9, 1943

MONDAY <i>Organic Finishing</i> 5 papers planned		TUES. P. M. <i>Hard Chromium</i> 4 papers planned
TUES. A. M. <i>Burring</i> 4 papers planned	PROGRAM WED. P. M. <i>Plating</i> 5 papers planned	TUES. A. M. <i>Cleaning</i> 4 papers planned
Tin, Silver, Black, Magnesium, Anodizing		

ANNUAL BANQUETS

MILWAUKEE BRANCH

Milwaukee Branch, A. E. S., will hold its Annual Educational Meeting and Banquet at the Schroeder Hotel, Milwaukee, on Saturday, April 24th. The Educational Session is scheduled for 2 p. m. in the Pere Marquette Room and will include papers by Messrs. Lewis, Pinner and Soderberg. The Banquet will begin at 7 p. m. in the Crystal Ball Room. Music and entertainment will follow. Admission is \$3.50 per plate and tickets and further information may be obtained from James Durnford, 2370 North 32nd Street, Milwaukee, Wis.

CINCINNATI BRANCH

Cincinnati Branch, A. E. S., will hold its Regional Dinner Meeting at the Hotel Gibson in Cincinnati on Saturday, March 27th. For further information, address Harry Misner, c/o Max Woher and Sons, 29 West 6th Street, Cincinnati, O.

NEWARK BRANCH

Newark Branch, A. E. S., will hold its Annual Educational Session including pictures and a speaker in the ballroom of the Robert Treat Hotel in Newark on May 1st. Refreshments will be served and details can be obtained from George Wagner, 1130 So. Long Avenue, Hillside, N. J.

ODDS and ENDS

We received from *Bill Sheane* a clipping enclosing the following: "*Description of an Engineer*—Through the ages, the engineer has continued to function, until now technical schools of our country yield 10,000 young hopefuls onto the American public, each armed with a slide rule, two handbooks, and a bad case of brain fatigue due to four years of unremitting toil. Some of these souls are needily saved by becoming bond salesmen and insurance agents. Some of the remaining souls eventually gain success after working incessantly as engineers by becoming advertising managers, accountants, salesmen and managing executives. But also some fail and they become assistant chief engineers, chief engineers, and if complete failures, consulting engineers." Wonder if he means us??

Anyhow is it any wonder that engineers often have bad cases of brain fatigue? As electrochemists we employed the centimeter for measurements. As engineers we had to convert to inches. Now, as editors, we find that printers don't use either but talk in terms of picas. And as a crowning touch, we have just learned that the British inch is not the same as ours but is 0.000113" longer, thus shattering our last hope.

They tell us that *Bob Sizelove* is down with a busted hip and *Harry McFall* called to tell us that he is as good as new after an accident in the line of duty.—This is one way to get a vacation in these hurried times.

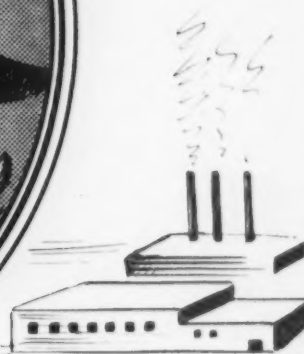
And we hope no one tells us that So-and-So was deferred by his draft board any more because he had ulcers or T. B. or somesuch, the lucky fellow. It ain't funny!!

We have always tried to be as specific as circumstances would allow when answering *Shop Problems*. However, we have been put to shame by one of our esteemed competitors (*Popular Science Monthly*.) In answer to a question as to how many feet a ball will travel before it comes to rest if it is dropped from a height of 16 feet and rebounds to half that distance, it is stated that on the twentieth bounce the ball will rise 0.0000152587890625 feet from the ground and the ball will have travelled 47.999969482421875 feet. This is what we would call a definite answer.

World at War Dept.: A photo taken in the cadmium plating department at *Vultee Aircraft*, out on the West Coast, shows a gorgeous blonde removing work from the tank—an ex-showgirl, no less. Not a model hired for the occasion either, but a regular plating room employee. We'll bet absenteeism is lower among the men in that department than in other plating plants.

What We Learn From the Ads: A towel manufacturer begs us to rub up our morale with one of his towels and a department store suggests that our morale can be improved by allowing them to reupholster our living room suite.—*Wanna bet?* A British company calls one of its aluminum alloys "Hiduminium" and a magnesium alloy is marketed as "Magnuminium".

Slogan of the Month: If You Want a Free World You've Got to Pay For It.—Buy War Bonds.



Let's

POOL OUR EFFORTS FOR VICTORY

Doubled production schedules are necessitating more concentrated effort from every branch of industry. Specialized assistance must be utilized to eliminate bottlenecks and speed up every operation from the cleaning cycle through the finished assembly — from the firing room to the firing line . . . that's the job for forty-three but together we will win if we have the will to win — the ingenuity — the foresight!

Old-timers will remember that co-operative service in place of "selling" and compounds formulated for special applications were introduced by MacDermid over twenty years ago . . . MacDermid service engineers are still working night and day helping determine the fastest, most efficient, economical way to clean war materials. Why not have them show you how to improve your product with these new specially formulated compounds perfected for war materials.

Anodex

PROCESS AND COMPOUNDS FOR STEEL — Blast inorganic dirt from ferrous metals with this approved reverse current process and these specially formulated high current density compounds. Fast. Economical. Lower operating cost!

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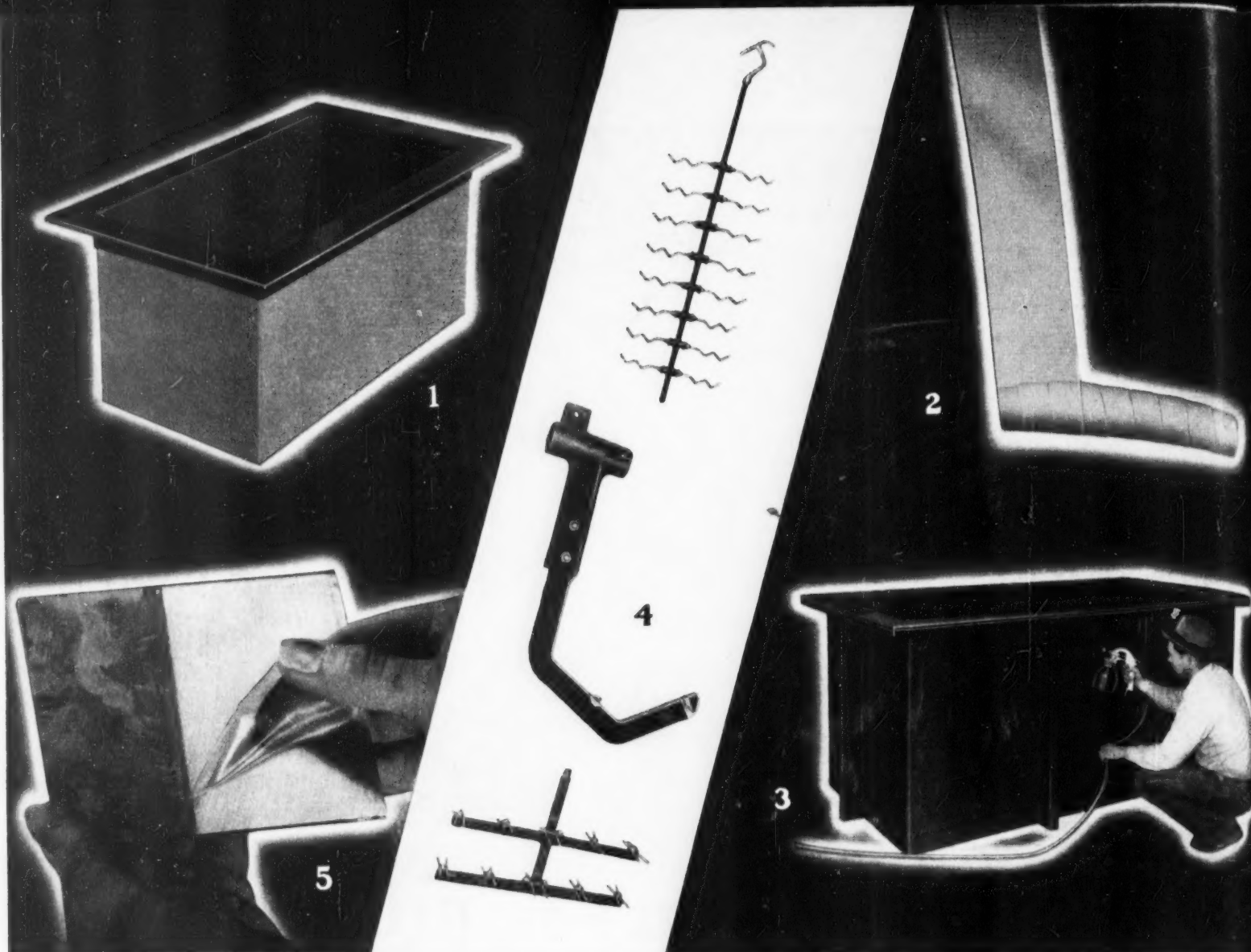
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1. Use Tygon tank linings to handle *any* pickling or plating solution. Tygon linings offer the physical advantages of rubber with none of rubber's chemical weaknesses. Tygon will not contaminate any solution — ends the necessity of compromising solutions to favor tanks or equipment. Tygon's high dielectric strength (35,000-50,000 volts per mm.) prevents electrolytic corrosion.

2. Wrap racks, bus bar, etc., with flexible, corrosion-resistant Tygon tape. After wrapping, the tape may be "heat" sealed or "solvent" sealed to form a continuous one-piece protective covering possessing both abrasive resistance and immunity to corrosion.

3. Apply Tygon Paint to the exterior of shop equipment for protection against corrosive fumes, condensates or spillage. Tygon Paint will resist more than 90% of the known corrosives, of particular importance to metal finishing plants where mixed fumes sometimes prove extremely vicious.

4. Protect hooks and racks with Tygon tape or Tygon liquid formulations. Tygon stops the necessity of frequent deplating, lessens current losses, prevents fouling or contamination of solutions. Since Tygon does not "wet" easily, electrolyte loss through "drag-out" is lessened. Use Tygon to keep hook joints tight in anodizing racks, or racks used in stripping tanks where corrosive conditions are unusually severe. Tygon maintains a tight connection, unaffected by corrosion.

5. Use Tygon Tempro-tec as a masking material, or as temporary protection during the waiting period between polishing and plating. Tygon Tempro-tec is applied by spray, brush, or dipping; air dries within 6-8 minutes to form a sturdy, transparent film which strips easily free. No further cleaning or degreasing is necessary.

For complete information on the use of Tygon anti-corrosive protection in metal finishing operations, write Engineering Department, U. S. Stoneware, Akron, Ohio. In Canada: Chamberlain Engineering, Ltd., Montreal.

**Tygon is a synthetic material resembling rubber in many physical characteristics. It is characterized by amazing resistance to corrosion, remarkable durability and flexibility in application and use. Tygon is but one of U. S. Stoneware's many products designed to control the destructive effects of corrosion in industry.*



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